
Gleb K.Samoilov

THE TYNE AND WEAR METRO DEVELOPED NETWORK AS THE BASIS OF THE URBAN TRANSPORT INTEGRATED SYSTEM

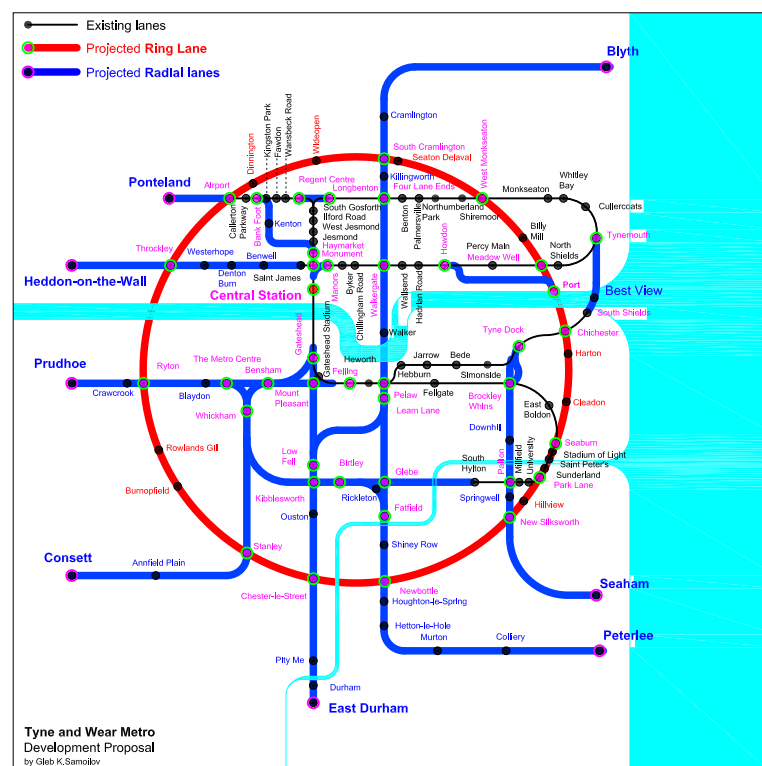


Newcastle-upon-Tyne
Almaty
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Самойлов Г.К.
РАЗВИТАЯ СЕТЬ МЕТРО ТАЙН И УИР КАК ОСНОВА ИНТЕГРИРОВАННОЙ
СИСТЕМЫ ГОРОДСКОГО ТРАНСПОРТА.
– Ньюкасл-апон-Тайн, Алматы: ЕВРОПОЛИС, Проектный Департамент, 2012.
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The Book discussed issues of improving of the North-East England Public Transport network accessibility, by developing the network of the Tyne and Wear Metro. Based on the review of different concepts for passenger transport in the Region, put forward in the second half of the XX – early XXI century, analyzes the opportunities and shows how best to transform the existing Local Tyne and Wear Metro network in developed Regional network of the NORTHUMBERLAND – TYNE and WEAR – DURHAM METRO. Step-wise Radial-Ring system is the basis of off-street transportation integration of Public and Private Transport different types. This allows us to solve a significant amount of Traffic, Socio-Economic and Environmental problems in the Region.

The list of references includes 468 titles; in going through the text illustrations are copyright 82 Author's drawings.

The Book is intended for professionals in the field of Public Transport, Urban Planning and Environmental Protection.

В Монографии рассмотрены вопросы повышения доступности сети общественного транспорта Северо-Восточного региона Англии путем развития сети Метрополитена Тайн и Уир. На основе рассмотрения различных концепций развития пассажирского транспорта региона, выдвинутых во второй половине XX – начале XXI века, проанализированы возможности и показаны оптимальные пути трансформации существующей локальной сети Тайн и Уир Метро в развитую региональную сеть НОРТУМБЕРЛЭНД – ТАЙН и УИР – ДАРЭМ МЕТРО. Поэтапно реализуемая радиально-кольцевая система внеуличного транспорта является основой интегрирования различных видов общественного и личного транспорта. Это позволяет решить значительное количество транспортных, социально-экономических и экологических проблем региона.

Перечень использованной литературы включает 468 наименований; в идущих по тексту иллюстрациях приведено 82 авторских чертежа.

Книга предназначена для специалистов в области общественного транспорта, городского планирования и охраны окружающей среды.

ISBN 978-601-06-1769-8



Samoilov G.K., 2012



Dedicated to my Family, my teachers and colleagues.

Best Regards, Gleb K. Samoilov

Leazes Terrace 10, NEWCASTLE-upon-TYNE, 2011

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THE INTRODUCTION

The topicality of the Problem

The Urban development of a system involves the coherent development of all sectors of human activity. To ensure normal functioning of a person in need well-developed and coordinated system of transportation services, which affect the whole of the city. Improvement of existing transport schemes has a social value, expressed in the quality of life and improving the health of citizens, increases employment, preserving the environment. The urban transport systems should be considered as solid education, with the general principles of operation and management tools.

Current economic conditions, integration, population growth and number of vehicles of different types of urban transport, the increase in harmful emissions pose new problems to improve technology and organization of transport service cities.

The Her Majesty's Government has identified strategies and policies for future development of transport [1]. Recommended to combine planning and transport at national, regional and local level. The following objectives:

- To provide a viable transport option for transporting people and goods;
- Ensure access to jobs, shops, facilities and services using public transport, walking and cycling;
- Reduce the need to travel short distances, especially by car.

To achieve these objectives, local authorities have in planning to ensure the full use of Public transport. High priority should be given to pedestrians, cyclists and public transport in urban centers. It should also be guaranteed to meet the needs of people with disabilities through the creation of the Full Barrier-free environment.

Accordingly, in view of the intended policy of optimizing of cities transport scheme with the Public transport priority in terms of interaction between different modes of transport is particularly relevant.

In the context of solving these problems, the Tyne and Wear Conurbation is of great interest. The territory of the Metropolitan area is located in the most densely populated part of the United Kingdom, and the Population of the Tyne and Wear Conurbation is the sixth largest in the Country [2].

Historically, Tyne and Wear Conurbation formed as an important center for the Wool trade and later the Main area of coal mining. Actively developing the Port with shipyards complex was one of the world's largest shipbuilding and repair centers. Currently, these industries restructured, reduced and mostly eliminated. Currently, major areas of economic activity – its trade, business services, office and educational activities.

The Public transport system is actively developing since the beginning of the Twentieth century, when the first tram line laid. By mid-century they have been completely replaced by buses. Well enough of cycling message, the route which the majority of sites are separated from the road. Newcastle Airport – is the main airport of the North-East of the Country. It is the tenth largest in passenger traffic and is the fastest growing regional airport of the United Kingdom. The Railway station is a major transit station on the East Coast. The Tyne and Wear Metro system combines underground and ground areas, which formed on the basis of commuter Rail lines. Over the past five years in the Metro is steadily growing volume of traffic [3]. Through the Conurbation area are several highways. Passengers have access to the international Ferry terminal [4].

The Tyne and Wear Metro development is part of the Plan to improve the economy of the Country and Region – Multi-billion pound push on UK Infrastructure Projects. – BBC Newcastle, Tyne Website, Monday 28th November 2011: "A multi-billion pound investment programme

aimed at getting Britain's economy moving is set to be announced. Most of the money is expected to come from the big British pension funds, as well as Chinese investment. However, £5bn will be paid for by further cuts in the present spending round. Various road schemes around Britain and rail lines in Newcastle and between Manchester and Leeds are thought to be among 40 projects earmarked for help. It comes ahead of Tuesday's autumn statement in which Chancellor George Osborne will outline spending plans. The government says the initiative, called the National Infrastructure Plan, would see it and private investors support both social and economic schemes over the coming decade. The 40 highlighted projects for support from the plan include the Metro system in Tyne and Wear, in the North East of England. The government wants to "accelerate the development" of the Tyne and wear Metro. BBC business editor Robert Peston said the move to aid investment in major infrastructure projects was "important for improving the productive potential of the British economy, making it more competitive" [5].

Taken together, the transport system of the Tyne and Wear Conurbation is of considerable interest, and its improvement in the priority of Public transport is an important task. Environmental aspects of the optimization of the transport scheme of agglomeration is crucial, since according to the program adopted by Newcastle will make "the first Carbon Neutral town".

The Degree of scrutiny of the Problem

Despite the fact, that the problems of development of different modes of transport, to improve their routing are constantly researched the topic for the past two centuries, they have attracted attention precisely at the turn of the century, when the ever-changing variety and multidirectional passenger flows have been increasingly caused many nodes slowdowns and even traffic jams.

The Development of the EU and the United Kingdom Public Transport identified a number of documents. Several studies have examined the application of the legislation and interpretation of policy in this area. In addressing issues of common interest a number of National, Regional, Municipal development programs and projects [6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38].

General problems of urban public transport dedicated research specialists from different countries (Mees, P.; Date, V.; White, P.; Schiefelbusch, M.; Dienel, H.L.; Telford, G.T.; Laursen, T.; Myers B.; Hass-Klau, C.; Crampton, G.; Ferlic, A.; Ivanova, E.A.; Bunting, M.; Mikhailov, A.Y.; Ryzhkov, I.P.; Divall, C.; Bond, W.; Richmond, J.; de Caro, M.; Amsler, Y.; Simpson, B.; Laconte, P.; Michael Ridley, M.; Staisch, E.; Ottley, G.; Simmons, J.; Bartlett, N.R.; Rosenwald, A. and others [39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73]).

Considerable attention is paid to Management, Economic and Planning problems (Buehler, R.; Pucher, J.; Dudley, G.; Mirabel, F.; Reymond, M.; Lo, H.K.; Tsekeris, T.; Voss, S.; Aftabuzzaman, M.; Currie, G.; Sarvi, M.; Gibson, R.; Ljungberg, A.; Veeneman, W.; Larsen, O.I.; Rekdal, J.; Ashmore, D.P.; Mellor, A.D.; Cortes, C.E.; Tirachini, A.; Hensher, D.A.; Jara-Diaz, S.R.; Appleyard, N.; Holmgren, J.; Dubinin, T.I.; Mogoras, A.A.; Kiggundu, A.T.; Abrate, G.; Piacenza, M.; Vannoni, D.; Eyssartier, H.; Dufoix, M.; Crisalli, U.; Cirianni, F.; Ianno, D.; Dorbritz, R.; Merov, Y.M.; Popova, I.M.; Benedyk, I.V.; Eldarkhanov H-M.Y.; Kozlova, V.P.; Krupin, A.S.; Kuanov, A.A.; Mailov, I.V.; Potekhin, I.A.; Kiryanov, A.L.; Sorokin, A.A.; Vilents, A.R. and others [74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109]).

Constantly considering the introduction of barrier-free environments (Alderson, A.; Lacey, A.; Imrie, R.; Hall, P.; Nanda, D.; Junca-Ubierna, J. A.; Broch, E. and others [110, 111, 112, 113, 114, 115]).

Special places in studies of public transport take in environmental issues (Khanna, P.; Buehler, R.; Pucher, J.; Buznikov, V.U.; Bell, M.; Hosseinloo, S.H.; Kanturska, U.; Hickman, R.; Ashiru, O.; Banister, D.; Konstantaki, M.; Wickens, E.; Abrzhina, L. L.; Akhtyamov R.G.;

Volkodaeva, M.V.; Kurdukov, V. N.; Zaprudin, A.G.; Vasileva, V.V.; Shadrina, O.A.; Ryabova, O.V.; Rizaeva, J. N.; Zhdanov, A.D.; Redikultseva, N.I.; Chernova, G.A.; Sarbaev, V.I.; Sannik, A.O.; Hunas K.; Kaverina, N.V.; Yakimov, M.R.; Agahanyants, P.F.; Negrov, N.S.; Perekladov, A. A. and others [116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141]).

Several studies reveal some aspects of the topic of this Research (Otto-Zimmermann, K.; Sueiro, V.P.; Wright, L.; Wright, L.; Dydkowski, G.; Tomanek, R.; Piwonska, A.; Koszelew, J.; Too, L.; Earl, G.; Albalade, D.; Bel, G.; Farag, S.; Lyons, G.; Walton, D.; Sunseri, S.; White, P.; Schiefelbusch, M.; Kane, M.P.; Dunn, R.; Joyce, M.; Mees, P.; Geurs, K.; Moura, J.L.; Ibeas, A.; dell'Olio, L.; Munoz, J.C.; de Grange, L.; Fare, R.; McMullen, B.S.; Noh, D.W.; Hu, K.C.; Antonov, M.N.; Branzia, R.L.; Khrapova, S.M.; Pytaleva, O.A.; Koster, P.; Van der Bijl, R.; De Zeeuw, F.; Aba, B.; Bast, H.; Ludwig, B.; Yan, X.; Wang, M.; Peng, Q.; Susniene, D.; Bazaras, Z.; Kleiza, V.; Crisalli, U.; Cirianni, F.; Ianno, D.; Mulley, C.; Nelson, J.D.; Dimova, I.P.; Kharitonova, A.S.; Korobov, S.A.; Litvinenko, M.L.; Mitrofanov, S.G.; Ponosov, Y.K.; Prokhorov, V.N.; Semenova, O.S.; Shavyraa, C.D.; Zakiullina, E.A.; Chumakov, L.L.; Feklin, E.V.; Kupriyanova, A.B.; Mokhova, G.V.; Sharov, M.I.; Utkin, A.A.; Zedgenizov, A.V.; Chikalina, S.L.; Shesterneva, N.N.; Aksenova, E.S.; Bakhtina, O.N.; Belitskaya, E.V.; Boyko, G.V.; Danilov, S.V.; Deshina, J.A.; Grinchenko, A.V.; Iliev, M.I.; Khmel'nitsky, V.V.; Kravchenko, E.E.; Prokhorov, V.N.; Sataev, A.M.; Sorokin, S.V.; Sunina, M.G.; Vlasov, Y.L.; Belous, A.V.; Ivanova, E.A.; Kharchenko, A.V.; Konycheva, N. A.; Ptsareva, J.G.; Radchenko, I.S.; Sorokin, A.A.; Ulyanovsky, I.A.; Volodchenko, S.V.; Makarevich, A.N.; Papaskua, A.A.; Sherchenkova, N.N.; Popova, O.V.; Shonin, A.Y.; Davidich, Y.A. and others [142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223]).

Especially important are issues of metro systems (Derrible, S.; Kennedy, C.; De la Calle, L.; Orriols, L.; Rienzo, F.; Oreste, P.; Pelizza, S.; Kharchenko, A.V.; Kudarov, R.S.; Lin, J.J.; Lo, C.W.; Garber, V.A.; Dudkin, E.P.; Paraskevopulo, O.J.; Paraskevopulo, J.G.; Bulucea, C.A.; Brandusa, C.; Abramson, V.M.; Loubotski, S.Y.; Bartak, J.; Schwandl, R.; Beadman, D.R.; Nordmark, A.; Gumusoglu, M.C.; Erdem, Y.; Solak, T.; Levanova, D.S.; Assis, W.O.; Milani, B.E.; Vorobieva, I.B.; Anttikoski, U.; Sarkka, P.; Eloranta, P.; Kulagin, N.I.; Robbins, M.; Thornblom, R.; Bengtsson, J.-E.; Kirdin, A.V.; Smirnov, V.I.; Smolova, M.V. and others [224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248]), and the mass use of bicycles and scooters (Daley, M.; Rissel, C.; Kaltenbrunner, A.; Su, F.; Schmocker, J.D.; Bell, M.; Hwang, J.J.; Pucher, J.; Dill, J.; Handy, S.; Tin Tin, S.; Su, J.; Buehler, R.; Gay, P.; Adesanya, A. and others [249, 250, 251, 252, 253, 254, 255, 256, 257, 258]).

Numerous studies focus on specific aspects of the Public transport in the Tyne and Wear Conurbation (Barr, S.; Fraszczyk, A.; Mulley, C.; Hensher, D.A.; Mulley, C.; Yahya, N.; Du, H.; Gross, P.; Skelsey, G.; Prickett, B.; Balcombe, R.J.; Davoudi S.; Heseltine, P.M.; Robinson, F.; Jones, S.R.; Pickett, M.W.; Canneaux, T.P.; Hanson, N.H.; Porter M.; Burrows, G. and others [260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318]).

However, although the theory and practice of the functioning of transport systems in various countries has a very deep study, the actual process of improvement in terms of priority of public transport in the United Kingdom is insufficiently studied.

The increasing intensity and recurring and to the increasing flows of temporary slowing of public and private transport in individual nodes indicate the need for in-depth study as factors

contributing to this slowdown, and identify opportunities to eliminate or compensate for these slowdowns in different ways.

Need to increase knowledge of the possibility of redistribution of passenger traffic by means of regulation, planning and spatial reorganization, and organizational and technical measures.

The Scientific novelty of this Research work

The above problems identified selection of the research topic, the scientific novelty of which is held for the first time in a systematic manner the study of the functioning of the existing system of the Public transport of the Tyne and Wear Conurbation, identifying and analyzing trends in the development of the Public transport with the possibility of redistribution of passenger traffic in the extensive network of off-street traffic.

The Hypothesis of this Research work

The existing Urban transport scheme is a direct reflection of its functional zoning, orientation and intensity of space-technology linkages, planning, social and cultural preferences in transportation and nomenclature and specifications of available vehicles. Accordingly, the Hypothesis of the Study is that the group identified the features of functioning of the transport scheme on the basis of typological and identifying emerging complexities of its operation in the aspect of direction and intensity of passenger traffic, the road network, the range and capacity of vehicles is sufficient to identify ways to optimize the transport scheme.

The Scientific-theoretical and Practical significance of this Research work

The Study has a specific scientific and theoretical and practical significance:

- Based on research by the author developed the theoretical and practical provisions which together solve a large and important in engineering, organizational planning, socio-cultural and environmental terms the problem of improving public transport of Tyne and Wear Conurbation;

- Explored important aspects of the interaction of different modes of Public transport, which allows, going to the next level, to some extent, predict trends in the territorial scheme of public transport at the North-East of the United Kingdom;

- Deepened the degree of scrutiny of Public transport of all territory of the United Kingdom.

This determines the possibility of using the results in such areas as:

- Design practice in the development of off-street transport and road network;
- Improving the organizational and technical measures in the field of urban public transport;

- Research works;

- The learning process for different transport's specializations.

The aim of the Study

The purpose of this study is to determine the main directions of the complex optimization of the urban transport scheme on the example of Tyne and Wear Conurbation.

Objectives of the Study

To achieve the objective of this study are to:

- Emphasizing the factors that determine the functioning of the Tyne and Wear conurbation Public transport;

- The study of existing conurbation's passenger flows on the parameters of their daily and seasonal focus and intensity;

- The study of the distribution of passenger flows on various modes of transport;

- The identification of possible directions of development of passenger traffic on the parameters changes their focus and intensity;

- The identification of promising typology of public transport in metropolitan area.

Boundaries of the Study

The solution of Study tasks carried out in the following boundaries:

- Historically limited to work abroad First and Second decade of the Twenty-first Century;
- Geographically confined to the Tyne and Wear metropolitan area and the adjacent settlements of Northumberland and Durham.

The object of the Study

As the object of the Study selected existing flow diagrams of different types of the Public and Private Transport and their functioning in a particular urban setting at the Tyne and Wear Conurbation.

Methods of studying

Used in the general scientific method of research is the dialectical way of learning from observations through a generalization to the practice.

In its context, are applied:

- the Integral-differential approach for dividing the data set on the basis of similarity of nodes and problems of the linear deceleration of flows of public transport, combine them in a typologically similar groups, reflecting the specificity of each of them;
- the Formal approach allowing tracing the development of various aspects of the problem for the selected chronological phases;
- the Iconographic approach allows us to investigate expression of features of different prototypes in the planning of specific organizational and technological circumstances;
- the Structural-semiotic approach, which allows simulating the development of different typological parameters.

The system and sequence of this Research work

Research methods identified the system and sequence of the Work:

- the selection and analysis of literature;
- the full-scale survey of the public transport system;
- the differentiation of the data;
- the comparison and analysis of characteristics;
- the formulation of the Author's Concept of improving the public transport system;
- the Text and Graphic interpretation of the Author's Conception;
- the testing of research results.

Testing and implementation of Research's results

Main provisions of the Research work were published in 19 articles (positions 6, 14, 17, 24, 25, 33, 35, 77, 85, 86, 102, 105, 108, 119, 131, 179, 180, 181, 213 – List of Author's publications on the topic of the Research) and presented for discussion at the specialized Internet forums (Author's drawings with Comments). The total number of online publications on the topic of the Research – 213.

This Research Paper is the collection of new research results and practical proposals, which define acceptable at this stage **WAYS TO OPTIMIZE OF THE URBAN TRANSPORT SCHEME WITH PRIORITY OF PUBLIC TRANSPORT, BASED ON DEVELOPED NETWORK OF THE METRO.**

THE AUTHOR EXPRESSES HIS GRATITUDE TO FOLLOWING ORGANIZATIONS

- HM Government. – The Department for Transport. – <http://www.dft.gov.uk/>
- HM Government. – Directgov. Public services all in one place. – <http://www.direct.gov.uk/>
- The Newcastle University. – <http://www.ncl.ac.uk/>
- The North East Research & Information Partnership. – NERIP. – <http://www.nerip.com/>
- The Centre for Accessible Environments. – <http://www.cae.org.uk/>
- The Tyne and Wear Freight Partnership. – <http://www.tyneandwearfreight.info/>
- The Tyne and Wear Integrated Transport Authority. – TWITA. – <http://www.twita.gov.uk/>
- The Nexus – Tyne and Wear Passenger Transport Executive. – <http://www.nexus.org.uk/>
- The Light Rail Transit Association. – <http://www.lrta.org/>
- The British Library. – <http://www.bl.uk/>
- The Library of Congress. – <http://www.loc.gov/>
- The Russian State Library. – <http://www.rsl.ru/>
- The Gateshead Council. – <http://www.gateshead.gov.uk/>
- The Newcastle upon Tyne City Council. – <http://www.newcastle-city-council.gov.uk/>
- The North Tyneside Council. – <http://www.northtyneside.gov.uk/>
- The South Tyneside Council. – <http://www.southtyneside.info/>
- The Sunderland City Council. – <http://www.sunderland.gov.uk/>
- The Northumberland County Council. – <http://www.northumberland.gov.uk/>
- The Durham County Council. – <http://www.durham.gov.uk/>
- The Institution of Engineering and Technology. – The IET. – <http://www.theiet.org/>
- The Chartered Institute of Logistics and Transport in the UK. – CILT(UK). – <http://www.ciltuk.org.uk/>
- The Chartered Institution of Highways & Transportation. – CIHT. – <http://www.ciht.org.uk/>
- The Institution of Structural Engineers. – <http://www.istructe.org/>
- The Institution of Civil Engineers. – ICE. – <http://ice.org.uk/>
- The Royal Town Planning Institute. – RTPI. – <http://www.rtpi.org.uk/>
- The Society of Operations Engineers / The Institute of Road Transport Engineers – SOE IRTE. – <http://www.soe.org.uk/>
- The Transport Planning Society. – TPS. – <http://www.tps.org.uk/>
- The American Society of Civil Engineers. – ASCE. – <http://www.asce.org/>
- The Canadian Society for Civil Engineering. – CSCE. – <http://www.csce.ca/>
- The Institute of Transportation Engineers. – ITE. – <http://ite.org/>
- The Japan Society of Civil Engineers – JSCE. – <http://www.jsce-int.org/>
- Verein Deutscher Ingenieure (The Association of German Engineers). – VDI. – <http://www.vdi.de/>
- The Transportation Research Board of the National Academies. – TRB. – <http://www.trb.org/>
- Trainclub.ru: Club of the railway and train journeys. – <http://trainclub.ru/>
- Amazines: Free Articles & Web Content. – <http://www.amazines.com/>
- Article Banker: Free Online Articles Directory. – <http://www.articlebanker.com/>
- Free Photos.biz: Free photos for business and personal use. – <http://www.free-photos.biz/>
- The SmartBrief Inc. – <http://www.smartbrief.com/>
- The Google Earth. – <http://www.google.com/earth/>
- The Wikipedia. The Free Encyclopedia. – <http://wikipedia.org/>
- The Wikimedia Commons. – <http://commons.wikimedia.org/wiki/>
- SkyscraperCity Forums. – <http://www.skyscrapercity.com/>

Chapter 1

MAIN TRENDS

IN THE MODERN POLITICAL-ECONOMIC STRATEGY OF URBAN PUBLIC TRANSPORT IN THE UNITED KINGDOM

1.1 Features of the National programs for the Development of Public Transport

The Public Transport is the integral part of the Transport System. Passenger transportation by different modes of public transport is not only complementary, but also to some extent determines the basic parameters of freight. Population mobility within districts, cities, regions, the Country or group of countries is the basis of an efficient economy. Improve the transport sector is an important component of the Social Development.

Current European concept of transport is reflected in the "White Paper, 2011" [6]. The Strategy includes 40 initiatives in various areas of Transport services. The Basis for the formation of an efficient, competitive and sustainable transport system is the formation of the unified transport zoning. This will increase the mobility of the population and increase throughput.

At the same time improve the environment by significantly reducing harmful emissions. For example, the 2050 plan to convert all city vehicles to non-traditional fuels, make low-carbon and 40% of aviation fuel and a 40% reduction in emissions of sea and river transport, more than half of the freight cars to redistribute to Railways and Waterways. Taken together, the 60% decrease emissions from transportation.

Main problems of European transport services, and referral to an optimal solution reported in the document "Transport 2050" [7]. The importance of the transport sector is the following. For a modern European transportation is the foundation of development. Effective transport systems allow European companies to compete successfully in the global market for goods and services. Transportation logistics is about 15% of the cost of finished goods.

The quality of transport services is an essential component of quality of life, since about 13% of the family budget is transportation costs. Creating new jobs and increase economic efficiency is largely due to sustained job of transportation networks, and their continuous development and improvement. In the transport sector employs about 10 million people. The transport sector generates about 5% of Gross Domestic Product purged.

Due to the ever-increasing mobility as the major problems in the document are options such as: the Rising cost of oil and the instability of oil supplies; the High dependence on the transport of petroleum products; the need for continued efforts to reduce greenhouse gas emissions; the Increasing complexity of operations in the field of transport logistics; the Lack of transport infrastructure in some regions and countries; the ever-growing competition on the World Market of the Passenger and the Freight transport.

The Strategy aims to transform the transport sector due to deep structural changes during the period 2011 – 2014.

The National policy of the Transport Development specifies the main provisions of EU documents and contains several provisions that reflect the specifics of the transport network of the United Kingdom. The official point of view, especially on the further development of various modes of transport in urban areas outlined in the document "The Future of Urban Transport" [11]. As part of the Integrated development program of efficient transport provides increased mobility of the population by giving for passengers a wider choice of transport to travel; choice of method

and route of delivery of goods; reducing congestion on the streets; improve the urban environment. A number of important issues is detailed in other studies of the Problem (for example, "An analysis of urban transport" [12]).

A number of important trends in the aspect of transport policy are emphasized in the Special research "Transport policy in 2011: a new direction?" [1]. In the documents of the HM Government's Department for Transport reflects the main directions of development and features of the modern National policy on Transport [9]: *"Our vision is for a transport system that is an engine for economic growth, but one that is also greener and safer and improves quality of life in our communities"*. In the aspect of the Present Study the greatest attention is drawn to the following positions:

- The Government plans to improve the system availability of transport for all groups of habitants. Everyone can use a transport service for the journey to work, study, medical treatment, buying goods, recreation. The problems of transport of vulnerable groups are identified and addressed by Local authorities based on Local transport plans.

- In the short term, buses and taxis will remain the dominant species of Local public transport. The Government plans to continue improving the network of local bus services. Special section of this Program is to develop measures to transform the local bus service into a viable, safe, convenient and effective alternative to personal car.

- All the more widespread will receive the System of Integrated transport services, with uniform or adapted tickets for several types of Public Transport.

- The Government supports and will encourage widespread bicycle travel. This allows you to partially solve the problem of congestion on highways, reduce air pollution generated by motor vehicles and promote healthy living.

- In the field of freight rates remain a priority are Efficiency, Safety and Environmental friendliness.

- Of great importance for convenient and safe passenger and cargo traffic has a set of Road efficient service. They are an important element of the integrated transport system. We have permanent control of the state of roads, sidewalks, curbs and roadsides.

- The actual remains of Motorsport development strategy. The main aim of the Strategy is to promote motorcycle within a safe and sustainable transport system. The main role in the development of this sector played by Local authorities.

- Still play an important role of the Rail transport, which solves a wide range of economic, social and environmental problems.

- Continuous improvement of transport provision for people with disabilities and improving the accessibility of Public Transport.

Directions for the further development of the United Kingdom infrastructure defined by "The National Infrastructure Plan 2011", published in November [13]. This Plan for the New Strategy to address the infrastructure needs of the economy. The Strategy has three elements:

- "First, the Government will plan for the medium term and across sectors. The National Infrastructure Plan brings together the first ever comprehensive cross-sectoral analysis of the UK's infrastructure networks and sets out a clear pipeline of over 500 infrastructure projects. Delivering these projects will ensure that the overall performance of the UK's infrastructure is maintained and improved over time. They will also address the areas where the UK's infrastructure lags the best performers in the world, while achieving best value for taxpayers and users."

- "Second, to mobilise the finance required to deliver these projects, the National Infrastructure Plan sets out a new approach to coordinating public and private investment in UK infrastructure. The Government committed at the 2010 Spending Review to prioritise public capital investment towards infrastructure that supports growth. Funded through further reductions

in current spending, the Government is now announcing additional investment in infrastructure at the 2011 Autumn Statement . In addition, the Government will use all the tools at its disposal to facilitate the private investment that will finance the majority of the UK's infrastructure. This includes bringing in new investors into UK infrastructure; introducing new sources of revenue such as tolling; allowing local authorities more flexibility in the way they use local receipts to fund major infrastructure in specific circumstances; and being willing to consider guarantees against specific risks that the market cannot bear."

- "Third, the Government will take an active role in ensuring the infrastructure in the Plan is delivered efficiently and on time, with priority given to those projects most critical for economic growth. A new Cabinet Committee, chaired by the Chief Secretary to the Treasury, will provide leadership to this work. It will ensure that all parts of Government play their part in tackling planning and regulatory delays and addressing key commercial and policy issues. The Government is also reforming the planning and consenting systems to tackle one of the largest sources of cost and delay in infrastructure delivery and taking forward the recommendations of the Infrastructure Cost Review, which found opportunities to realise savings of £20 to £30 billion over the next decade."

Is declared the fundamentally new approach to infrastructure Financing. The priority is encouraging Private investment. Through these investments will finance most of the new and existing infrastructure projects.

It is planned to provide a convenient and reliable communication between all the urban agglomerations of the Country. With Regional and Local transport schemes should not restrict the development of Suburban areas.

Appropriate seems to improve integration between different transport modes. In the field of Passenger transport, this will improve choice of transport for regular visits and occasional trips. In the field of Freight it will convert most from Road to Railways and Waterways.

A large amount of funding allocated to measures to reduce harmful emissions into the atmosphere. One of the areas is to encourage Walking and Cycling.

The Document is of great importance for further development of the entire infrastructure planning system. As indicated in this document: "The publication of this National Infrastructure Plan marks a step change in the UK's approach to infrastructure investment and delivery. It sets out both immediate plans and longer term ambitions that will inform the way infrastructure is planned, financed and delivered over the coming decade. The Government will regularly update the performance and cost indices, the priority list and pipeline of projects and programmes in this Plan and assess progress made against the actions".

"The National Infrastructure Plan 2011", setting out the priorities of the Government, is an important step forward for the Spatial Planning and improvement of the Transport System throughout the Country and each region.

1.2 Features of the North-East Regional programs for the Development of Public Transport

The North-Eastern region is one of nine Regional divisions of the England Official part. This region is composed of four Sub-regions: NORTHUMBERLAND (Berwick-upon-Tweed, Alnwick, Tynedale, Castle Morpeth, Wansbeck, Blyth Valley); TYNE AND WEAR (Newcastle-upon-Tyne, North Tyneside, South Tyneside, Gateshead, Sunderland), COUNTY DURHAM (Derwentside, Chester-le-Street, Durham, Wear Valley, Teesdale, Sedgfield, Easington); TEES VALLEY (Hartlepool, Darlington, Stockton-on-Tees, Middlesbrough, Redcar and Cleveland).

Main directions of transport development in the North-East Region are determined by the North-East Regional Transport Strategy. This Strategy is an important element of the overall Regional Spatial Strategy, which sets out the Development plans for fifteen years. These plans define the direction of economic development, the volume of new housing, priorities for transport infrastructure development and environmental safety measures for the conservation of the Sustainable development potential.

The objective of the North-East Regional Transport Strategy is a long-term planning of the transport development in the Region. This is the result of integration actually available areas for development, as different types of transport and transport infrastructure in general, which are optimal in the aspect of the general concept of the social, economic and spatial development of the North-East Region. Development Priorities for transport are regional interpretations of the National Transport Policy. Detailing the main areas of the Transport policy involves improving transport infrastructure for the implementation of models of sustainable development of transport services, improving route networks, ensuring optimum public accessibility of residential areas, workplaces, shopping and entertainment businesses, places of public entertainment.

Regional Transport Strategy is the basis for sub-regional Local Development Documents and Local Transport Plans.

Main aspects of the Regional Transport Strategy of the 2000s [17] were to:

- "Improve access to markets and contribute to the competitiveness of North East businesses";
- "Provide effective and sustainable access to the North East for inbound tourism";
- "Improve access to employment, learning, health facilities and services for all sections of society";
- "Support the development of a dynamic labor market for North East businesses";
- "Minimize the impact of the movement of people and goods on the environment and climate change";
- "Reduce the need to travel, particularly by private vehicles";
- "Promote and increase the proportion of journeys made by public transport, cycling and walking through demand management measures";
- "Improve connectivity and accessibility between the Tyne & Wear and Tees Valley city regions" (reasons: "The urban areas of the Tees Valley and the Tyne & Wear sub-regions are the economic powerhouses of the North East of England. They are the main centers of population and employment and generate the majority of GDP and wealth in the region. Together they form vital places for people to live, work and visit. Both Tyne & Wear and Tees Valley City Regions also possess major sea ports and expanding airports that connect the UK to the rest of the World. Connectivity between the two City Regions is therefore an important strategic consideration as policy makers seek to improve the economic situation in the North East and improve productivity in line with the central priorities of the Northern Way programme");
- "Improve access and connectivity to the North East's international gateways";
- "Make best use of resources and existing infrastructure";
- "Ensure safe transport networks and infrastructure".

Now the North-East Regional Transport Strategy of the 2000s is irrevocable. The new version of the Document is still under development.

Long-term, with the Government's view, the direction of the Transport Infrastructure Development in the Region indicated in Autumn Forecast Statement by the Chancellor of the Exchequer, Rt Hon George Osborne MP (29 November 2011) [319]. Officially informed that: "To support the infrastructure investment priorities identified in the National Infrastructure Plan 2011, the Autumn Statement announced a major new programme of investment in projects that will support the economy now and enhance productivity in the longer term. In the North East this

includes: Electrification of the Transpennine Express; Tyne and Wear Metro; Tees Multimodal Bio-Freight Terminal” [320].

Among the projects holds the special place has the Tyne and Wear Metro. Its development is important for the entire North-Eastern Region. The development of the Regional Network of Metro discussed in neighboring counties (for example, Northumberland – “PETITION – BRING METRO TO SOUTH EAST NORTHUMBERLAND” / Northumberland COUNTY COUNCIL, 5th October 2011 [321]).

A number of important functions to implement the Regional Agency. For example: the ONE NORTH EAST is the Regional Development Agency (RDA) covering North East England. It is one of nine RDAs in England that were established to transform the English regions through sustainable economic development. ONE NORTH EAST, along with all the English regional development agencies (RDAs), will close at the end of March 2012. The Government announced in last summer's Budget a new policy for regional economic development which means the role of RDAs will be replaced by local enterprise partnerships [18].

An important place in the structure of the North-East Regional Planning takes Regional Spatial Strategy (RSS). The RSS forms the model of the regional economic development and ways of solving problems of this development, identifies priorities in transport demand. This is the statutory document of the Development plan, which incorporates the Transport Strategy of the North-East, and provides a spatial planning framework for the preparation of all Local Development Documents, Local Transport Plans, and regional and sub regional strategies. The Regional Spatial Strategy provides development directions of the Region for the 15-20 years. In accordance with the New directives of the Government in this document to make adjustments.

1.3 Features of the Tyne and Wear municipal programs for Development of Public Transport

In accordance with the definition [322], “the Local Transport Plan (LTP) is a 5-Year strategy for the development of local, integrated transport, supported by a programme of transport improvements. The LTP also forms a bid to Government for funding of the improvements. It is the main source of capital funding for the programme. The LTP sets out a series of targets to allow each authority to monitor the effect of their strategy”.

Currently, the directive of the Tyne and Wear transport Development is the Local Transport Plan 3 (LTP3) [19]. It is the Strategy for the development of all modes of transport for the period from 2011 to 2021. Ten-year period is divided into three phases. Detailed First phase – 2011 / 2014 – included in the Main Document [20]. This current Local Transport Plan is the third in a series of operating from the early 21-th century documents. The First plan (LTP1) covered the period 2001/ 2006, the Second plan (LTP2) covered the period 2006 / 2011. The Plan is made in accordance with National, Regional and Local development strategies. The Plan is a supplement to the Transport Strategy for North East Local Enterprise Partnership, which covers parts of the County Durham and the Northumberland, socio-economically integrated with the Tyne and Wear.

The Concept of the Local Transport Plan 3 is to: “*Tyne and Wear will have a fully integrated and sustainable transport network, allowing everyone the opportunity to achieve their full potential and have a high quality of life. Our strategic networks will support the efficient movement of people and goods within and beyond Tyne and Wear, and a comprehensive network of pedestrian, cycle and passenger transport links will ensure that everyone has access to employment, training, community services and facilities*”. To achieve this goal it is necessary to address the five inter-related problems:

- “to support the economic development, regeneration and competitiveness of Tyne and Wear, improving the efficiency, reliability and integration of transport networks across all modes;
- to reduce carbon emissions produced by local transport movements, and to strengthen our networks against the effects of climate change and extreme weather events;
- to contribute to healthier and safer communities in Tyne and Wear, with higher levels of physical activity and personal security;
- to create a fairer Tyne and Wear, providing everyone with the opportunity to achieve their full potential and access a wide range of employment, training, facilities and services;
- to protect, preserve and enhance our natural and built environments, improving quality of life and creating high quality public places”.

This Goal and Problems are a natural development of the basic ideas of the Local Transport Plan -2 (2006 / 2011): “Our vision is: *“To see Tyne and Wear continue to develop as an area where all residents have better access to a more prosperous, safer, healthier and more sustainable lifestyle in a more attractive environment”*. We are convinced that the most effective way to realize this vision is to develop Tyne and Wear by promoting economic regeneration, greater economic competitiveness and achieving greater prosperity for the people of the city-region. Accordingly, the overarching policy priorities for Tyne and Wear are: Economic regeneration, greater economic competitiveness and prosperity; Reducing inequality, improving social inclusion and community cohesion; Stabilizing population and reducing out-migration; Better environmental quality, sustainability and quality of life; Improving participation and attainment in education; Improving health standards and reducing premature deaths. These aims are wholly consistent with Government’s desire for sustainable improvements in economic performance, an inclusive society, a better environment and a better quality of life” [21].

The Strategic Framework of the Local Transport Plan 3 is based on three key measures: managing the demand for travel; managing and further integrating existing networks; targeting new investment at top priority challenges. As noted in his report about LTP 3, the Councillor David Wood, Chair of the Tyne and Wear Integrated Transport Authority: “We see no contradiction between economic growth and the needs of the environment – indeed, our rich natural heritage and landscape are priceless economic assets” [19].

The document is structured into three parts with sixteen chapters.

Part 1: Introduction and background

Chapter 1. INTRODUCTION: About this document, Role of the Local Transport Plan, Building on the achievements of LTP2, Review of document.

Chapter 2. STATUTORY ASSESSMENTS OF THE LTP: Introduction, Strategic Environmental Assessment, Health Impact Assessment, Equality Impact Assessment, Habitats Regulation Assessment.

Chapter 3. CHANGES FROM DRAFT TO FINAL: Listening to transport users, Summary of responses, Summary of changes.

Chapter 4. CONTEXT: Policy context, Transport geography of Tyne and Wear (Overview; Tyne and Wear's transport network), Socio-economic background, Sustainability Baseline and Key Issues, Trends and forecasts.

Part 2: Objectives, key issues and challenges

Chapter 5. THE VISION.

Chapter 6. SUPPORTING ECONOMIC DEVELOPMENT AND REGENERATION: Regeneration goals, Reduce the gap between Tyne and Wear's economic growth rate and other English regions, Reliability and predictability of journey times, Connectivity and access to labour markets, Housing provision, Resilience.

Chapter 7. ADDRESSING CLIMATE CHANGE: Introduction, Targets, Forecasts for Tyne and Wear, Meeting the target (*Road transport; Aviation and shipping*).

Chapter 8. SUPPORTING SAFE AND SUSTAINABLE COMMUNITIES: Enhance social inclusion by improving accessibility, Road transport accidents, Air quality, Active travel, Crime and fear of crime, Noise, End to end journeys, Green Infrastructure, Landscape and Townscape.

Part 3: Developing and delivering the strategy

Chapter 9. DELIVERING THE VISION.

Chapter 10. IMPROVING INFORMATION.

Chapter 11. IMPROVING SAFETY: Road safety, Crime and fear of crime.

Chapter 12. MAINTAINING INFRASTRUCTURE: Highway maintenance, Bridge maintenance, Public transport infrastructure maintenance.

Chapter 13. MANAGING THE DEMAND FOR TRAVEL: Integrating transport and land use planning, Smarter choices, Travel planning, Parking, Car clubs.

Chapter 14. BETTER MANAGEMENT AND INTEGRATION OF EXISTING NETWORKS: Network Management (*Network Management Plans; UTMC; Emission management; Priority lanes*), Active travel (*Streets for everyone; Cycling; Rights of Way / Green Infrastructure Network; Local Access Forum*), Public transport (*Smart ticketing; Metro; Bus; Rail; Ferry; Taxi and private hire vehicles; Community transport; Coaches; Scholars travel; Concessionary travel; Park and ride*), Powered two wheelers, Freight, Integration.

Chapter 15. INVESTING IN OUR NETWORKS: Schemes in progress (*The New Tyne Crossing*), Schemes under development (*A19 junction improvements; Sunderland Central Route; Sunderland Strategic Transport Corridor; Tyne and Wear Bus Corridor Improvement Programme*).

Chapter 16. SCHEMES FOR THE FUTURE: Walking and cycling, Highway management and capacity, Bus, Rail.

The implementation of the Plan includes a clear monitoring its implementation. For example, the "Tyne and Wear Integrated Transport Authority. Annual Report & Accounts, 2011" on the results of a year [22]. Stages of implementing the control of the Main document are regular reports to the Full Committee (for example, Agenda 26th Jan 2012; Agenda 24th Nov 2011; Agenda 22nd Sep 2011 [323, 324, 325]) and the Metro Subcommittee (for example, Agenda 13th Jan 2012; Agenda 8th Dec 2011; Agenda 1st Sep 2011 [326, 327, 328]).

Possible changes in the funding of individual programs will be incorporated by making the appropriate adjustments. In accordance with National Infrastructure Plan 2011 and Autumn Statement 2011 by the Government the Tyne and Wear Local Transport Plan 3 will be adjusted. It will be reflected in more detail some aspects of the Metro.

The Autumn Forecast Statement by the Chancellor of the Exchequer, Rt Hon George Osborne MP (29 November 2011), indicated: "In the North East we will bring forward investment on the Tyne and Wear Metro" [319].

The relevant section of the Autumn Statement 2011 stated: "Encouraging investment and exports as a route to a more balanced economy [...] **A.26 Tyne and Wear Metro** – The Government will invest £4 million to accelerate the upgrade to the Tyne and Wear Metro (q)" [14].

For details of some Environmental aspects of the Local Transport Plan 3 are important TYNE AND WEAR JOINT TRANSPORT WORKING GROUP researches (by Atkins Ltd.) [329, 330, 331].

THE FIRST UPDATE OF THE LOCAL TRANSPORT PLAN 3 IS SCHEDULED FOR THE FIRST HALF OF 2012.

Local Transport Plans develop the Basic ideas of separate municipal units. Example – the SUNDERLAND Unitary Development Plan. This document was developed in 1998 and adjusted in 2004, 2007 and 2009 [23]. Main Content of the Document:

- PART I (Introduction and Strategy);
- PART II (Planning for People, Resources for the Future);

- URBAN REGENERATION (Economic Development, Housing, Shopping, Community Facilities, Leisure);
- ENVIRONMENT (Environmental Protection, Built Environment, Countryside and Nature Conservation, Minerals and Waste Disposal);
- TRANSPORTATION (Transportation Framework, Public Transport, Personal Mobility, Highways, Traffic Management and Freight);
- GENERAL (Impact on the Environment, Implementing the Plan);
- AREA PROPOSALS (Sunderland South, City Centre, Sunderland North, Washington, Houghton-Hetton).

The basic principle of the Transport Development indicated the following: "A central principle underpinning the City Council's transport strategy for the regeneration of Central Sunderland is to capitalise on the high quality public transport accessibility enjoyed by much of the area and encourage increased use of public transport. The City Council will also seek to constrain growth in the use of the private car by controlling the amount of private car parking available to residents and the occupiers of commercial development in locations where access to public transport is readily available. This accords with Regional Planning Guidance that also seeks to reduce and control the level of parking in new developments" [24].

It is important to the formation of the Sunderland Strategic Transport Corridor (SSTC). The entire corridor will be built in 15 years [25]. This Transport Corridor proposals are in full compliance with National, Regional and Local strategies outlined in the following documents: The Sunderland Economic Masterplan; The City of Sunderland Unitary Development Plan (1998); The Unitary Development Plan Alteration No. 2 (Central Sunderland, 2007); The Emerging Local Development Framework for the City of Sunderland, The Second Local Transport Plan for Tyne and Wear, The Third Local Transport Plan for Tyne and Wear; Enterprise Zone; The North East England Plan (the Regional Spatial Strategy); The Regional Transport Strategy; The Regional Economic Strategy; The Regional Housing Strategy; The Delivering a Sustainable Transport System; The Shared Priorities for Transport; The draft National Planning Policy Framework; Government 30 Year Plan; The Department for Transport Business Plan (2011 - 2015).

The result of the Transport Corridor formation will open new opportunities for the development of the Central Sunderland sub-area: "By 2026, Central Sunderland will comprise a rich and diverse mix of residential, employment, commercial and leisure areas. New mixed-use development will have rejuvenated the southern bank of the river within the setting of the landmark bridge. First class leisure developments will draw visitors to Stadium Village. New retail and employment development - and a new residential population - will have secured the vitality and viability of the city centre. The ethos of the "University City" will be well established with a thriving high tech and software sector clustered in the city centre. New high-quality roads will connect the key development sites in Central Sunderland to the wider region. The city centre will be the hub of the local public transport network, with high quality public realm and accessibility for all" [26].

The First Step in the formation of this Corridor is the New Road Bridge [38]. The New Wear Bridge Project Team: Project Director – D.Abdy; Highways – E.Wallage; Utilities – J.Ramsay; Integration – A.Calvert; Land acquisition and business case – K.Atkinson; Procurement – S.Lumsdon; Communications – J.Wicking; Bridge designers – SPENCE ASSOCIATES; Consulting structural engineers – TECHNIKER; Highway designers – JACOBS; Cost consultants – CORDEROY; CPO and public inquiry – SANDERSON WEATHERALL LLP. Partners: SUNDERLAND CITY COUNCIL; ONE NORTH EAST; NEXUS; HIGHWAYS AGENCY; ENVIRONMENT AGENCY. The peculiar shape of the Bridge, as the Original Spatial Reference Point, was approved after public consultation in 2008. The decision on funding and detailed design began in 2009. The new bridge will have four lanes, pedestrian walkways and bicycle paths.

The Project is a significant contribution to the formation of the Sustainable Transport System of the City. Implementation of this project will accelerate the economic development of the Sunderland, which is supposed to make the Regional center of "Low-carbon Economy".

Conclusions of the First chapter

Held in the First chapter analysis led to following conclusions:

1. Program objectives of European transport to the Middle of the Twenty First Century requires the solution of several interrelated tasks to damage the European Union as a whole, groups of countries, individual countries, regions, conurbations and individual settlements.
2. Need to accelerate the development of electric transport.
3. It is advisable to increase passenger and freight Off-street Transport.
4. Congestion of the road network in the cities can not be successfully achieved through the use of separate decisions by one or more directions. Urban road network, operating in the mode of overload can be brought into the "normal" operation only when the consistent application of a package of measures in all possible directions: Improvement of urban planning and urban policy more effective; Construction and reconstruction of road infrastructure, improve its repair and maintenance; Improvement of logistics and organization of transport for freight trucks; Improvement of public transport; Improving the organization of road safety; Implementation of parking policy; Restrictions on vehicular traffic.
5. The disadvantages are the restrictive measures of the extreme unpopularity, the need for sophisticated means for monitoring compliance with limitations, as well as the possibility that their introduction may lead not to a decrease in the intensity of car use, and to a simple redistribution of traffic on the road network, which will be overloaded infrastructure at the borders of coverage limitations.
6. Necessary improvement of tariff policy and the development of route networks to redistribute most of passengers from Personal car transport to public transport.
7. Development and improvement of the integration of different modes of the Public Transport.
8. Significant contribution to the solution of these problems can contribute to improve the System of Public Transportation in the United Kingdom as a whole, in the North-East region of England as the particular, in the Tyne and Wear Conurbation as the specifically.
9. Main directions of the transport policy of the United Kingdom are detailed in the strategy of the North-East region of England and specified in local transport plans of the Tyne and Wear.
10. Fixed in the National Infrastructure Plan 2011 a New approach to the planning and funding of National, Regional and Local infrastructure projects, focuses on the medium term.
11. The New principle of infrastructure projects financing determines the broad involvement of Private investment.

The Chapter 2

THE MAIN DIRECTIONS OF THE TYNE AND WEAR CONURBATION PUBLIC TRANSPORT DEVELOPMENT IN SECOND HALF OF 20th – EARLY 21st CENTURY

2.1 The Rail service and the Metro service

Until the mid-twentieth century in the Conurbation Public Transport System included: suburban railways, trams, trolleybuses and buses.

The Railway service at present consists of three lines with ten operated stations [332].

Existing Railway stations in Tyne and Wear:

- **East Coast Main Line** – from *LONDON KINGS CROSS* through - BIRTLEY (*closed*) - LAMESLEY (*closed*) - LOW FELL (*closed*) - BENSHAM (*closed*) - **NEWCASTLE CENTRAL** - **MANORS** - HEATON (*closed*) - FOREST HALL (*closed*) - KILLINGWORTH (*closed*) - ANNITSFORD (*closed*) - to *EDINBURGH Waverley*;
- **Durham Coast Line** – from **NEWCASTLE CENTRAL** - HEWORTH - **MONKWEARMOUTH** - **SUNDERLAND** - to *MIDDLESBROUGH*;
- **Tyne Valley Line** – from **NEWCASTLE CENTRAL** - **DUNSTON** - **METROCENTRE** - **BLAYDON** - RYTON (*closed*) - to *CARLISLE CITADEL*.

Former railway lines:

- *Blyth and Tyne Railway* – Backworth - Benton - Cullercoats - Gosforth - Holywell - Jesmond - Moor Edge - New Bridge Street - North Shields - Percy Main - Prospect Hill - Tynemouth - Whitley Bay;
- *Derwent Valley Railway* – Swalwell - Rowlands Gill - to Blackhill;
- *Newcastle and Carlisle Railway* – Newcastle Central - Elswick - Scotswood - Blaydon - Ryton (*closed*) – to Carlisle Citadel;
- *North Wylam loop* – Lemington - Newburn - Heddon-on-the-Wall - North Wylam;
- *Ponteland Light Railway* – Gosforth - West Gosforth - Coxlodge - Kenton - Callerton – to Ponteland;
- *Riverside branch* – Byker - Saint Peter's (Tyneside) - Saint Anthony's - Walker - Carville - Point Pleasant - Willington Quay.

The development of railways in the Twentieth and Twenty-First centuries can be seen on the maps, for example, 1902, 1906, 1947, 1963, 1964 and Existing network of the Rail transit scheme [333, 334, 335, 336, 337, 338].

The Tramway service was an important part of public transport in the Conurbation to the middle of the twentieth century [339]:

NEWCASTLE-UPON-TYNE Tram: Horse – from 1878 to 13 April 1901; Steam – from 1882 to 1897; Electric – from 16 December 1901 to 4 March 1950. Through workings to Gateshead from 1923. Newcastle served by Gateshead tramway system to 4 August 1951.

GOSFORTH – WALLSEND – NORTH SHIELDS (TYNESIDE) Tram: Electric – from 22 September 1902 to 6 April 1930.

NORTH SHIELDS – TYNEMOUTH – WHITLEY BAY (TYNEMOUTH) Tram: Horse – from 1880 to (date not fixed); Steam – from 1884 to (date not fixed); Electric – from 18 March 1901 to 4 August 1931.

GATESHEAD Tram: Steam – from October 1883 to 8 May 1901; Electric – from 8 May 1901 to 4 August 1951. Through working to Newcastle from 1923.

SOUTH SHIELDS Tram: Horse – from 1 August 1883 to 1885 and from March 1887 to 31 January 1906; Electric – 30 March 1906 to 31 March 1946.

JARROW Tram: Electric – from 9 November 1906 to 30 June 1929.

SUNDERLAND Tram: Horse – from 28 April 1879 to 19 February 1901; Steam – only in 1880; Electric – 15 August 1900 to 1 October 1954.

GRANGETOWN – RYHOPE – PHILADELPHIA – HETTON-LE-HOLE (SUNDERLAND DISTRICT) Tram: Electric – from 10 June 1905 to 12 July 1925.

WEST HARTLEPOOL Tram: Steam – from 1884 to 1891; Electric – from 19 May 1896 to 25 March 1927.

The Trolleybus service gradually replaced the Tramway network [340]:

NEWCASTLE UPON TYNE Trolleybus service – from 1933 (other sources: 1 October 1935) to 1968 (other sources: 1 October 1966); Number of routes – 15 (other sources - 28).

SOUTH SHIELDS Trolleybus service – from 12 October 1936 to 29 April 1964; Number of routes – 11.

By the late 1960s, trams and trolleybuses were replaced by buses.

The idea of forming a network of **the Metro service** (Light Rail) was justified by a study conducted in the late 1960s: “Evaluating the options for improved public transport, the study team found that the best course of action was to convert the suburban British Rail network into a rapid transit system with direct penetration into the central area. The bus network would be restructured to complement the rapid transit system, and car commuters encouraged to transfer to rapid transit for peak hour trips to and from the centre. These measures would have the benefit of holding back the growth of peak traffic flows across the highly congested cross-Tyne road links” [341].

THE MAIN STAGES OF METRO DEVELOPMENT [342]:

1971 – Transport planners devise a light rail solution for urban transport integration on Tyneside.

1972 – Following extensive lobbying the Government agrees to fund the Metro project.

1974 – Construction gets underway with tunnels driven beneath the streets of Newcastle and new viaducts built across the River Tyne and Ouseburn.

1981 – Metro is officially opened by The Queen.

1984 – The final phase of 55,0 km Metro system is opened in South Shields.

1991 – The Metro link to Newcastle Airport is completed.

2002 – The extension of Metro to Sunderland is opened by The Queen.

Various stages of construction of fixed schemes: **“The evolution of the METRO MAP, from 1969 to the present day”** [343].

The Publication Author’s comments:

“1 - 1969 (Pre-system opening) the original Tyneside PTE proposed route, from “Rapid Transit for Tyneside” published by Tyneside PTE.”

“2 - 1971 (still pre-opening) and the ‘diagramatic’ map first appears. NOTE, the station called ‘Osborne’, in between West Jesmond and Jesmond stations.”

“3 - 10th August 1980, the Metro opens and its first public-use map shows that only the ‘Haymarket to Tynemouth’ (Yellow Line) stretch is open.”

“4 - April 1981, the ‘Haymarket to Bank Foot’ stretch (Green Line) opens.”

"5 - October 1981, The Metro bridge opens (Royal opening on 6th November) and the lines extend through Monument (for the first time) and on to Heworth. The 'Red Line' for peak day-time journeys, is also added to the map."

"6 - 1982, the riverside part of the Yellow Line from Tynemouth, through the second level at Monument, to St James' opens."

"7 - 1982, the Green Line is extended from Heworth to South Shields, and the second 'peak day-time' line (the Blue Line) between St James' and North Shields, is added to the map."

"8 - 1985, Kingston Park and Pelaw stations are added and a 'mark' for the future Palmersville station, can be seen on the map."

"9 - 17th November 1991, the line to Newcastle Airport opens and is added to the map, on the Green Line."

"10 - The extension to Sunderland opens, and the map changes considerably. The 'sloping line' of the South Gosforth to Gateshead stretch is straightened, the two 'peak time' lines (Red & Blue lines) are gone, and the yellow line now diverts off at Pelaw, down to South Hylton."

The set of diagrams is corrected and updated:

- 'Early 2000' – "Here is the Metro Map of that period, showing the Sunderland extension (The 'South Hylton Line' to be more correct) when it was under construction ..." (by "Newcastle Historian", "Skyscrapercity.com" Moderator and Archivist. – November, 14, 2009) [344];
- The Sunderland Extension - 2002: Sunderland – South Hylton (by "gleconsam", "Skyscrapercity.com" Registered User. – September, 12, 2011) [345; 346];
- The Tyne and Wear Metro Map (the Existing position) [347].

From 60 stations 39 stations were built specifically for the Tyne and Wear Metro system and 21 stations were built prior to the Metro system, but have since been converted or re-built for Metro use [348]:

- *Opened August 11, 1980 five new stations* – FOUR LANE ENDS, HAYMARKET, ILFORD ROAD, JESMOND, SHIREMOOR;
- *Metro since August 11, 1980 nine existed stations* – BENTON (March 1, 1871), CULLERCOATS (July 7, 1882), LONGBENTON (July 14, 1947), MONKSEATON (July 25, 1915), SOUTH GOSFORTH (June 27, 1864), TYNEMOUTH (July 7, 1882), WEST JESMOND (December 1, 1900), WEST MONKSEATON (March 2, 1933), WHITLEY BAY (October 9, 1910);
- *Opened May 10, 1981 four new stations* – BANK FOOT, FAWDON, REGENT CENTRE, WANSBECK ROAD;
- *Opened November 15, 1981 five new stations* – CENTRAL STATION, GATESHEAD, GATESHEAD STADIUM (called "Old Fold" in the planning stages), HEWORTH, MONUMENT;
- *Metro since November 15, 1981 existed station* – FELLING (November 18, 1896);
- *Opened November 14, 1982 six new stations* – BYKER, CHILLINGHAM ROAD, HADRIAN ROAD, MANORS, MEADOW WELL (originally called "Smiths Park"), SAINT JAMES;
- *Metro since November 14, 1982 five existed stations* – HOWDON (June 18, 1839), NORTH SHIELDS (1890), PERCY MAIN (June 18, 1839), WALKERGATE (June 19, 1839), WALLSEND (June 19, 1839);
- *Opened March 24, 1984 four new stations* – BEDE, CHICHESTER, SOUTH SHIELDS, TYNE DOCK;
- *Metro since March 24, 1984 two existed stations* – HEBBURN (June 18, 1839), JARROW (March 1, 1872);
- *Opened September 16, 1985 two new stations* – KINGSTON PARK, PELAW;
- *The Opened March 19, 1986 new station* – PALMERSVILLE;

- *Opened November 17, 1991 two new stations – AIRPORT, CALLERTON PARKWAY;*
- *Opened March 31, 2002 seven new stations – FELLGATE, MILLFIELD, PALLION, SAINT PETER'S, SOUTH HYLTON, STADIUM OF LIGHT, UNIVERSITY;*
- *Metro since March 31, 2002 four existed stations – BROCKLEY WHINS (formerly "Boldon Colliery" as a heavy rail station), EAST BOLDON, SEABURN, SUNDERLAND;*
- *The Opened April 28, 2002 new station – PARK LANE;*
- *The Opened December 11, 2005 new station – NORTHUMBERLAND PARK;*
- *The Opened March 17, 2008 new station – SIMONSIDE.*

To study the importance of such schemes are as "The Present geographically accurate map of the Metro system" [349]; "Existing "Pelaw – Gosforth" route scheme" [350], "Existing "Southshields" route scheme" [351], "Existing "Sunderland" route scheme" [352], "Existing "Airport" route scheme" [353] and "Existing "Tynecoastloop" route scheme" [354].

The Type of the Metro system: Rapid transit / Light rail; Line length: 77.7 km (48.3 mi). Includes about 45 km converted railway line, opened in 1839. Operating in the heart of Newcastle as a full-fledged Subway, on the outskirts is the intersection with the highways and at one site using one way with commuter trains. Predominantly terrestrial.

Modern Route Services: THE GREEN LINE (Airport – Central Station – South Hylton) and THE YELLOW LINE (Saint James – Tynemouth – Central Station – South Shields). One of the features of the Metro system is to route the Yellow line, which includes the Large Loop. Because of this Tyne-and-Wear Metro is one of two of the world's metro systems in which a train, following the same route twice passes the same station (the other - in Vancouver).

The existing Metro network schematized in several ways: the Map by R.Schwandl [355]; the Map by S.Morgan [356]; the Map by "Thetrams.co.uk" [357]; the Map by "Spottingworld.com" [358]. The original schemes implemented "Benedict" (Benedict – Simtropolis Geek, "Simtropolis.com" Registered User – October, 22nd, 2011). The Author of publication comments: "This is an interesting system to play with graphically (probably because it is relatively simple). Although I forced the system into concentric circles above, it actually works as spirals (or pseudo-spirals, since I left the connectors for shared stations the same size). [...] And the finished, compact, product.." [359]. The most widespread is the scheme that uses the Official Metro Operator (for example – the Image - 2007) [360].

Initially, Metro was considered as part of an integrated transport: "When the Metro opened it was claimed to be the hub of the UK's first integrated public transport system. Metro was intended to cover trunk journeys, while buses were reoriented toward shorter local trips, integrated with the Metro schedule, to bring passengers to and from Metro stations, using unified ticketing. [...] Integration lasted until deregulation of bus routes in 1986" [361].

2.2 The Bus service, the Taxi service and the Parking service

At present the most common form of Conurbation Public Transport is the Bus. This is the result of Bus replacing all Trolley-buses and Tramway routes in the middle of the Twentieth century. Importance for the development of Bus service was conducted in the mid-1980s deregulation of the market for Local bus routes: "The Transport Act 1985 brought in the process of deregulation, with area radical changes to the previous state of affairs:

- the need for road service licenses was removed, so that any bus operator (subject to safety standards and restraints on traffic congestion) was free to run a bus service on a commercial basis whenever and wherever he chose, and to set his own fares;
- publicly-owned bus operators were transformed into private companies, working on the same commercial basis as other operators;

- local authorities were allowed to intervene only to secure those areas of supply that the market would not provide, and they had to do so through competitive tendering – their powers to subsidize public transport were limited to specific services not supplied commercially and concessionary travel facilities for particular groups of people.

Bus deregulation came into effect in Tyne and Wear in October 1986” [362].

However, at this time (late 2011) the situation is as follows.

The current Schedule (November, 2011) [363] – 251 routes (Singles, Twins and Grouped). These routes are divided into seven areas – within the Area routes; interband areas routes; transverse Area routes. Routes served by several operators. Schedule occasionally adjusted (the numbering of routes, number of stops, the range of motion, the operating company). In an example with data published in the second half of 2011.

Bus services in the NEWCASTLE AREA include 90 routes (March, 2011) [364]:

40 routes operated by “ARRIVA”: 3 (Battle Hill – Freeman Hospital / Regent Centre) ; 6 (Newcastle – Jesmond Vale); 10 (Newcastle – Cramlington – Blyth); 11 (Newcastle – Cramlington – Blyth); 13 (West Denton – Throckley – West Denton); 41 (Newcastle – Cramlington – Blyth); 43 (Newcastle – Cramlington / Morpeth); 44 (Newcastle – Hazlerigg – Dinnington); 45 (Newcastle – Gosforth – Brunswick Industrial Estate / Dinnington); 46 / 46A (Newcastle – Great Park); 52 (Ashington – Cramlington – Freeman Hospital); 53 (Whitley Bay – Cramlington – Blyth); 53A (Whitley Bay – Cramlington); 55 (Newcastle – Meadow Estate); 56 (Newcastle – North Shields); 306 (Newcastle – Tynemouth); 308 (Newcastle – Whitley Bay – Blyth); 309 (Newcastle – Cobalt Business Park Whitley Bay – Blyth); 353 (Kingston Park – Airport – Dudley – Four Lane Ends / Freeman Hospital); 501 (Newcastle – Alnwick – Bamburg – Berwick); 505 (Newcastle – Alnwick – Berwick); 518 (Newcastle – Morpeth – Alnwick); 555 (Four Lane Ends Metro – Balliol Business Park – Four Lane Ends Metro); X4 (Newcastle – Blyth); X5 (Newcastle – Cramlington – Blyth); X6 (Newcastle – Cramlington – Blyth); X8 (Newcastle – Shiremoor – Whitley Bay); X9 (Newcastle – Cobalt Business Park – Whitley Bay); X10 (Newcastle – Cramlington – Blyth); X11 (Newcastle – Regent Centre – Cramlington – Blyth); X12 (Newcastle – Blyth Community College); X13 (Newcastle – Regent Centre – Cramlington – Blyth); X14 (Newcastle – Morpeth); X15 (Newcastle – Pegswood); X18 (Newcastle – Morpeth – Asington); X20 (Newcastle – Ashington – Newbiggin by the Sea); X21 (Newcastle – Newbiggin by the Sea); X22 (Newcastle – Bedlington – Ashington); X40 (Newcastle – Great Park); X44 (Newcastle – Hazlerigg – Dinnington).

33 routes operated by “Stagecoach”: 1 (Four Lane Ends – Newcastle – South Benwell / Slatyford); 6 (Metrocentre – Kingston Park – Freeman Hospital); 7 (Metrocentre – Kenton Bar Estate – Freeman Hospital); 8 (Newcastle – Kenton Bar Estate – Freeman Hospital); 10 (North Kenton – Newcastle – West Denton Park); 11 (North Kenton – Newcastle – West Denton - Shops); 12 (Fenham – Newcastle – Walker – Wallsend); 15 (Walker – Newcastle – Kenton); 15A (Walker – Newcastle – Kenton); 22 (Throckley – Wallsend Metro); 30 (Silver Lonnen – Newcastle – Fawdon Park Road); 31 (Silver Lonnen – Newcastle – Montagu Estate); 35 (Newcastle – Fawdon Red House Farm – Newcastle); 36 (Newcastle – Fenham); 38 (Whickham View – Freeman Hospital); 39 (Dumpling Hall – Newcastle – Walker); 40 (Chapel House – Newcastle – Walker – Wallsend Metro); 62 (North Wallbottle – Newcastle – Killingworth); 63 (Killingworth – Newcastle – Chapel House); 68 (Four Lane Ends – DSS Tyneview Park); 71 (Newcastle – Throckley); 72 (Newcastle – Chapel House); 87 (Newcastle – Newbiggin Hall – Newcastle); 88 (Newcastle – Newbiggin Hall – Newcastle); 100 (Metrocentre – Newcastle); X47 (Newcastle – Kingston Park – Newcastle); X63 (Newcastle – Killingworth – Newcastle); X77 (Newcastle – Ponteland – Darras Hall); X78 (Newcastle – Ponteland – Darras Hall); X79 (Newcastle –

Ponteland / Kirkley Hall); X82 (Newcastle – Throkley); X87 (Newcastle – Newbiggin Hall Estate – Newcastle); X88 (Newcastle – Newbiggin Hall Estate – Newcastle).

7 routes operated by “Go North East”: 2 (Whitley Bay – North Shields – Newcastle – Wrekenton); 58 (Hadrian Park – Newcastle – Gateshead – Heworth); 74 (Newcastle – Great Whittington); 307 (Newcastle – Hadrian Lode – Benton Asda); N58 (Whitley Bay – Newcastle – Gateshead – Heworth); Q1 (Gateshead Metro – Gateshead Quays – Newcastle Quayside – Central Station); Q2 (Ouseburn Valley – Saint Peter’s Basin – Quayside – Haymarket).

3 routes operated by “VEOLIA”: K1 (Four Lane Ends – Killingworth – Four Lane Ends); K2 (Four Lane Ends – Killingworth – Greenhills); M71 (Kingston Park – Newbiggin Hall – Kingston Park).

2 routes operated by “ARRIVA” / “Stagecoach” / “VEOLIA”: 32 (Newcastle – Kenton Bar – Four Lane Ends – Byker – Newcastle); 32A (Newcastle – Four Lane Ends – Kenton Bar – Newcastle).

2 routes operated by “ARRIVA” / “Stagecoach”: 18 (Forest Hall – Longbenton – Heaton – Wallsend); 685 (Newcastle – Carlisle).

1 route operated by “ARRIVA” / “Go North East” / “VEOLIA”: 1 (Whitley Bay – North Shields – Newcastle – Gateshead Metro – Kibblesworth).

1 route operated by “ARRIVA” / “VEOLIA”: 4 (Metrocentre – Cowgate – West Denton – Callerton).

1 route operated by “Stagecoach” / “VEOLIA”: 33 (Newcastle – Jesmond – Gosforth Hollywood Avenue).

Bus services in the NORTH TYNESIDE AREA include 64 routes – (March, 2011)
[365]:

33 routes operated by “ARRIVA”: 3 (Battle Hill – Freeman Hospital / Regent Centre); 10 (Newcastle – Gosforth – Wideopen – Cramlington – Blyth); 11 (Newcastle – Gosforth – Wideopen – Cramlington – Blyth); 43 (Newcastle – Wideopen – Cramlington – Morpeth); 44 (Newcastle – Hazlerigg – Dinnington); 45 (Newcastle – Gosforth – Brunswick Industrial Estate / Dinnington); 52 (Ashington – Cramlington – Killingworth – Freeman Hospital); 53 (Whitley Bay – Cramlington – Blyth); 53A (Whitley Bay – Cramlington); 55 (Newcastle – DSS Longbenton – Forest Hall / Meadway); 56 (Newcastle – Gosforth – Killingworth – North Shields); 57 (North Shields – Whitley Bay – Cramlington); 57A (North Shields – Whitley Bay – Cramlington); 306 (Newcastle – Tynemouth); 308 (Newcastle – Blyth); 333 (Howdon Road – North Shields – Fish Quay – North Shields – Howdon Road); 353 (Kingston Park – Airport – Dudley – Four Lane Ends / Freeman Hospital); 555 (Four Lane Ends Metro – Balliol Business Park – Four Lane Ends Metro); X4 (Newcastle – Quorum Business Park – Seaton Delaval – Blyth); X5 (Newcastle – Cramlington – Blyth); X6 (Newcastle – Cramlington – Blyth); X8 (Newcastle – Cobalt Business Park – Whitley Bay); X9 (Newcastle – Battle Hill – Marden – Whitley Bay); X10 (Newcastle – Regent Centre – Cramlington – Blyth); X11 (Newcastle – Regent Centre – Cramlington – Blyth); X12 (Newcastle – Blyth Community College); X13 (Newcastle – Regent Centre – Cramlington – Blyth); X14 (Newcastle – Regent Centre – Blagdon – Morpeth); X15 (Newcastle – Regent Centre – Stobhill – Pegswood); X20 (Newcastle – North Seaton – Ashington – Newbiggin by the Sea); X21 (Newcastle – North Seaton – Ashington – Newbiggin by the Sea); X22 (Newcastle – Nedderton – Stakeford – Ashington – North Seaton); X44 (Newcastle – Hazlerigg – Dinnington).

12 routes operated by “Go North East”: 2 (Whitley Bay – North Shields – Newcastle – Gateshead Metro – Wrekenton); 17A (Wallsend Metro – North Shields – Whitley Bay); 40 (Wallsend – Battle Hill – Hadrian Park); 41 (Wallsend – Howdon – Hadrian Park); 58 / N58 (Hadrian Park – Newcastle – Gateshead – Heworth); 80 (North Shields – Howdon – Wallsend); 85 (North Shields – Whitley Bay – North Shields); 86 (North Shields – Whitley Bay – North Shields); 307 (Newcastle – Benton Asda); 309 (Newcastle – Cobalt Business Park – Whitley Bay

– Blyth); 310 (Newcastle – North Shields); 318 (Ashington – Cramlington – Cobalt Business Park).

6 routes operated by “VEOLIA”: 59 (Whitley Bay – Shiremoor – Backworth); 319 (Jarrow – Percy Main – East Howdon – Jarrow); 335 (Four Lane Ends – Hadrian Park – Cobalt Business Park); K1 (Four Lane Ends – Killingworth – Four Lane Ends); K2-Connect Transport (Four Lane Ends – Killingworth – Greenhills); W3 (Whitley Bay – Uplands – West Monkseaton – South Willfield).

4 routes operated by “Stagecoach”: 62 (North Walbottle – Newcastle – Killingworth); 63 (Killingworth – Newcastle – Chapel House); 68 (Four Lane Ends – DSS Tyneview Park); X63 (Newcastle – Killingworth – Newcastle).

1 route operated by “Phoenix”: W1A (Whitley Bay Metro – Whitley Bay – West Monkseaton – Earsdon Grange).

2 routes operated by “Phoenix” / “VEOLIA”: W1 (Whitley Bay Metro – Whitley Bay – West Monkseaton – Earsdon Grange); W2 (Whitley Bay Metro – Whitley Bay – Brierdene).

2 routes operated by “ARRIVA” / “Go North East” / “VEOLIA”: 1 (Whitley Bay – North Shields – Newcastle – Gateshead Metro – Kibblesworth); 17 (Cramlington – Wallsend Metro – North Shields – Whitley Bay).

2 routes operated by “ARRIVA” / “VEOLIA”: 85A (Whitley Bay – New York – North Shields); 86A (North Shields – Verne Road – Whitley Bay).

1 route operated by “Go North East” / “VEOLIA”: 19 (Northumberland Park – Percy Main – Royal Quays – North Shields Ferry – North Shields Town Centre).

1 routes operated by “ARRIVA” / “Stagecoach”: 18 (Forest Hall – Longbenton – Heaton – Wallsend).

Bus services in the WESTERN GATESHEAD AREA include 40 routes (August, 2010) [366]:

29 routes operated by “Go North East”: 10 (Newcastle – Crawcrook – Hexham); 10A (Newcastle – Crawcrook – Hexham); 31 (Newcastle – Blaydon – Winlaton); 32 (Newcastle – Blaydon – Winlaton – Hanover Estate); 43 (Newcastle – Metrocentre – Stanley – Durham); 43B (Newcastle – Gateshead – Lobley Hill – Stanley – Durham); 44 (Newcastle – Metrocentre – Stanley – Durham); 45 (Newcastle – Metrocentre – Consett); 46 (Newcastle – Metrocentre – Consett); 47 (Newcastle – Rowland Gill – Blackhall Mill); 48 (Gateshead Interchange – Mertocentre – Winlaton); 49 (Gateshead Interchange – Blaydon – Winlaton); 49A (Gateshead Interchange – Blaydon – Winlaton); 69 (Winlaton – Low Fell – Pelaw – Wardley); 69A (Blackhall Mill – Low Fell – Pelaw – Wardley); 70 (Newcastle – Sunniside – Consett); 95 (Gateshead – Lobley Hill – Dunston – Metrocentre); 96 / 96A (Gateshead – Lobley Hill – Dunston – Metrocentre); 97 (Newcastle – Whicham – Metrocentre); 98 / 98A (Newcastle – Dunston – Whicham – Dunston – Newcastle); 604 (Newcastle – Low Prudhoe); 673 (Newcastle – Ryton – Whittonstall); 686 (Ovington – Prudhoe); N97 (Newcastle – Lobley Hill – Whicham – Dunston – Newcastle); X30 (Newcastle – Stanley – Lanchester); X31 (Newcastle – Stanley – Lanchester); X66 (Gateshead Interchange – Metrocentre); X70 (Newcastle – Sunniside – Consett); X71 (Newcastle – Sunniside – Consett).

4 routes operated by “Classic Coaches”: 10C (Metrocentre – Ryton – Clara Vale); R5 (Sherburn Tower Estate – Rowlands Gill); S1 (Metrocentre – Metrocentre Retail Park – Metrocentre); S2 (Metrocentre – The Watermark).

3 routes operated by “Stagecoach”: 6 (Metrocentre – Kingston Park – Freeman Hospital); 7 (Metrocentre – Kenton Bar Estate – Freeman Hospital); 100 (Newcastle – Metrocentre).

2 routes operated by “VEOLIA”: R6 (Ryton – Winlaton – High Spen); R7 (Ryton – Winlaton – High Spen).

1 route operated by “Anthony Kane Taxis”: Taxi Bus 12 (Blaydon – Winlaton Mill).

1 route operated by "Ian's Travel": Taxi Bus 43 (Whickham, Watergate Estate – Metrocentre).

Bus services in the EAST GATESHEAD AREA include 63 routes (November, 2009) [367]:

55 routes operated by "Go North East": 1 (Whitley Bay –North Shields – Wallsend – Gateshead Metro – Kibblesworth); 2 (Whitley Bay / North Shields – Newcastle – Wrekenton); 21(Newcastle – Chester-le-Street / Durham / Bishop Auckland); 22 (Newcastle – Chester-le-Street – Woldridge Park); 25 (Newcastle / Gateshead – Langley Park); 25A (Newcastle – Chester-le-Street); 26 (Pennywell – Sunderland – Boldon – Heworth); 27 (Newcastle – Heworth Metro – Jarrow – South Shields); 27A (Newcastle – Heworth Metro – Jarrow – South Shields); 28 (Newcastle – Chester-le-Street); 28 A (Newcastle – Chester-le-Street); 29 (Gateshead Metro – Kibblesworth); 48 (Gateshead Metro – Metrocentre – Winlaton); 49 (Gateshead Metro – Blaydon – Winlaton); 49A (Gateshead Metro – Blaydon – Winlaton); 51 / 52 (Gateshead Metro – Heworth – Metro – Springwell – Gateshead Metro); 53 / 54 (Newcastle – Gateshead Metro – Saltwell Park – Newcastle); 56 / 56A (Newcastle – Springwell – Concord – Sunderland); 57 (Newcastle – Gateshead – Leam Lane – Wardley); 57A (Heworth – Fellgate – South Shields); 57B (Heworth – Fellgate – South Shields); 57C (Heworth Metro – Wardley); 58 / N58 (Hadrian Park – Newcastle – Gateshead – Heworth); 68 (Leam Lane – Felling Square – Heworth – Bill Quay); 69 (Winlaton – Low Fell – Pelaw – Wardley); 69A (Blackhall Mill – Low Fell – Pelaw – Wardley); 70 (Newcastle – Sunniside – Consett); 77 / 77A (Metrocentre – Birtley – Rickleton – Washington); 78 / 78A (Sunderland – Chester-le-Street – Stanley – Consett); 87 (Newcastle – Heworth Metro – Fellgate); 91 (Newcastle – Team Valley); 93 / 94 (Gateshead Metro – Heworth Metro – Springwell – Gateshead Metro); 95 (Gateshead – Lobley Hill – Dunston – Metrocentre); 96 / 96A (Gateshead – Lobley Hill – Dunston – Metrocentre); 97 (Newcastle – Whickham – Metrocentre); 98 / 98A (Newcastle – Dunston – Whickham – Dunston – Newcastle); 184 (Washington – Birtley – Portmeads); 994 (Heworth Metro – Follingsby Park); M1 (Heworth Metro – Washington – Easington Lane); M2 (Heworth – Washington – Waterview Park); M3 / M3A (Heworth – Washington – Chester-le-Street); N21 (Newcastle – Chester-le-Street – Durham); X1 (Newcastle – Houghton – Easington Lane); X2 (Sunderland – Washington – Newcastle); X3 (Newcastle – Washington – Houghton-le-Spring); X4 (Newcastle – Washington – Washington Hospital); X9 (Newcastle – Peterlee – Billingham – Middlesbrough); X10 (Newcastle – Middlesbrough); X22 (Durham / Chester-le-Street – Birtley – Metrocentre); X30 (Newcastle – Stanley – Lanchester); X31 (Newcastle – Stanley – Lanchester); X66 (Gateshead Metro – Metrocentre); X70 (Newcastle – Sunniside – Consett); X71 (Newcastle – Sunniside – Consett); X93 (Newcastle – Murton).

3 routes operated by "ROBINSONS": Taxi Bus 10 (Wrekenton – Eighton Bank – Wrekenton); Taxi Bus 11 (Wrekenton – Bank Lane Estate – Wrekenton); Taxi Bus 14 (Northside Estate – Birtley – Northside Estate).

2 routes operated by "Stagecoach": Q1 (Gateshead Metro – Gateshead Quays – Newcastle Quayside – Newcastle – Central Station); X34 (Newcastle – Horsley Hill – Newcastle).

1 route operated by "A-LANE Coaches": M12 (Pelaw Metro – Fairway Estate – Pelaw Metro).

1 route operated by "ARRIVA": X2 (Newcastle – Chester-le-Street – Durham).

1 route operated by "VEOLIA": 69 (Heworth Metro – Friars Goos – Heworth Metro).

Bus services in the WASHINGTON & HOUGHTON-LE-SPRING AREA include 40 routes (February, 2010) [368]:

35 routes operated by "Go North East": 2A (Sunderland – Washington); 2C (Sunderland – Washington); 20 (Sunderland – Houghton – Durham / University Hospital Durham); 20X (Sunderland – Houghton – Durham / University Hospital Durham); 35 (South Shields –

Sunderland – Houghton / Hetton / Low Moorsley / South Hetton / Peterlee); 37 (Sunderland – Tunstall Bank Estate – Washington); 38 (Sunderland – Tunstall Bank Estate – Houghton-le-Spring); 50 (South Shields – Washington – Chester-le-Street – Durham); 50A (South Shields – Washington – Chester-le-Street – Durham); 56 (Newcastle – Springwell – Concord – Sunderland); 65 (Seaham Harbour – Hetton – Durham); 71 (Sunderland – Houghton-le-Spring – Chester-le-Street); 73 (Concord – Teal Farm – Sunderland); 77 (Metrocentre – Birtley – Rickleton – Washington); 77A (Washington – Rickleton – Birtley – Metrocentre); 78 (Sunderland – Chester-le-Street – Stanley – Consett); 78A (Sunderland – Chester-le-Street – Stanley – Consett); 79 (Washington – Barnwell – Burnside Estate – Hall Lane Estate); 184 (Washington – Birtley – Portmeads); 203 (Peterlee – Seaham – Houghton-le-Spring); M1 (Heworth Metro – Washington – Easington Lane); M2 (Heworth – Washington – Waterview Park); M3 (Heworth Metro – Washington – Chester-le-Street); M3A (Heworth Metro – Washington – Chester-le-Street); W2 (Coach Road Estate – Washington – Ayton – Birtley); W3 (Coach Road Estate – Washington – Ayton); W5 (Barmston Court – Washington Galleries – Concord); W6 (Brady Square – Washington Galleries – Concord); X1 (Newcastle – Houghton – Easington Lane); X2 (Sunderland – Washington – Newcastle); X3 (Newcastle – Washington – Houghton-le-Spring); X4 (Newcastle – Washington – Washington Hospital); X35 (Sunderland – Houghton – Hartlepool); X88 (Metrocentre – Concord – Sunderland).

3 routes operated by “VEOLIA”: 50 (South Shields – Washington – Chester-le-Street); 77 (Birtley – Rickleton – Barnwell Estate); 168 (East Rainton – Hetton-le-Hole – Easington Lane – Hetton-le-Hole – East Rainton).

2 routes operated by “Station Taxis”: Taxi Bus 20 (Houghton-le-Spring – Fence Houses – Houghton-le-Spring); Taxi Bus 21 (Houghton-le-Spring – Dairy Lane – Houghton-le-Spring).

Bus services in the SOUTH TYNESIDE AREA include 33 routes (February, 2011)

[369]:

17 routes operated by “Stagecoach”: 1 (South Shields – Biddick Hall – South Shields); 2 (South Shields – Biddick Hall – South Shields); 3 (South Shields – Biddick Hall – South Shields); 4 (South Shields – Biddick Hall – South Shields); 7 (South Shields – Marsden – South Shields); 8 (South Shields – Marsden – South Shields); 10 / 11 (South Shields – South Tyneside Hospital – Biddick Hall – Jarrow); 12 (The Lonnen – South Shields); 12A (Watson Avenue – South Shields); 17 (South Shields – Whiteleas – South Shields); 18 (South Shields – Brockley Whins – South Shields); 30 (South Shields – Cleadon – Boldon Colliery); E1 (South Shields – Whitburn – Sunderland); E2 (South Shields – Whitburn – Sunderland); E6 (South Shields – Whitburn – Sunderland); X20 (South Shields – Simonside – Fellgate); X34 (Newcastle – Horsley Hill – Newcastle).

9 routes operated by “Go North East”: 5 (South Shields – South Tyneside Hospital – Fellgate Estate – Jarrow); 9 (Jarrow – Sunderland); 16 (Lukes Lane Estate – Jarrow – South Tyneside Hospital – South Shields); 26 (Sunderland – Hylton – Boldon – Heworth); 27 (Newcastle – Heworth Metro – Jarrow – South Shields); 35 (South Shields – Sunderland – Houghton / Hetton / Low Moorsley / South Hetton / Peterlee); 50 (South Shields – Washington – Chester-le-Street – Durham); 50A (South Shields – Washington – Chester-le-Street); 88 (Jarrow – South Shields).

3 routes operated by “VEOLIA”: 319 (Jarrow – Percy Main – East Howdon – Jarrow); 515 (Heworth – Hebburn); 558 (Cotsworlds Estate – Cleadon – Seaburn).

2 routes operated by “Eurocub”: Taxi Bus 503 (South Shields – Low Simonside); Taxi Bus 504 (South Shields – Horsley Hill).

1 route operated by “Budget Buses”: Taxi Bus 502 (South Shields Local Bus).

1 route operated by “Anthony Kane Taxis”: Taxi Bus 529 (Lukes Lane Estate – Bill Quay – Heworth).

Bus services in the SUNDERLAND AREA include 53 routes (December, 2010) [370]:

25 routes operated by "Go North East": 2A (Sunderland – Washington); 2C (Sunderland – Washington); 8 (South Hylton – Sunderland); 9 (Jarrow – Sunderland); 20 (Sunderland – Houghton – Durham / University Hospital Durham); 20X (Sunderland – Houghton – Durham); 23B (Sunderland – Hartlepool); 26 (Sunderland – Heworth); 35 (South Shields – Sunderland – Houghton / Hetton / Low Moorsley / South Hetton / Peterlee); 36A (Sunderland – Hylton Castle – Sunderland); 38 (Sunderland – Tunstall Bank Estate); 39 (Doxford International – Sunderland – Pennywell); 42 (Vicarage Farm Estate – Sunderland – Vicarage Farm Estate); 56 (Newcastle – Springwell – Concord – Sunderland); 60 (Sunderland – Seaham – Parkside); 61 (Sunderland – Murton Station); 71 (Sunderland – Houghton-le-Spring – Chester-le-Street); 73 (Concord – Teal Farm – Sunderland); 78 (Sunderland – Chester-le-Street – Stanley – Consett); 78A (Sunderland – Chester-le-Street – Stanley – Consett); 99 (Hylton Castle – Southwick – Seaburn); 202 (Sunderland – Dalton Park – Peterlee); X35 (Sunderland – Houghton – Hartlepool); X88 (Metrocentre – Concord – Sunderland); N56 (Newcastle – Springwell – Concord – Sunderland).

17 routes operated by "Stagecoach": 3 (Hylton Castle – Sunderland – Farrington); 4 (Doxford Park – Farrington – Sunderland – Downhill); 5 / 5A (Doxford Park – Gilley Law – Sunderland – Docks – Gilley Law – Doxford Park); 7 (Sunderland – Fulwell Grange – Witherwack); 8 (South Hylton – Sunderland); 10 (Pennywell – Sunderland – Grangetown); 11 (Pennywell – Sunderland – Grangetown); 12 (Sunderland – Silksworth – Sunderland); 13 (Town End Farm – Sunderland – Doxford Park); 16 (Red House – Sunderland – Hastings Hill); 18 / 19 (Grindon – Southwick – Seaburn – Sunderland – Grangetown – Grindon); 20 (Pennywell – Sunderland); 23 (Thorney Close – Sunderland – Dene Estate); E1 (South Shields – Whitburn – Sunderland); E2 (South Shields – Whitburn – Sunderland); E6 (South Shields – Whitburn – Sunderland); X1 (Sunderland – Doxford International).

4 routes operated by "VEOLIA": 39 (Sunderland – Pennywell); 558 (Seaburn – Cleadon Cotswolds Estate); 592 (Doxford International – Southwick – Roker); 593 (Doxford International – Pallion Retail Park).

3 routes operated by "ARRIVA": 23 (Sunderland – Hartlepool); 31 (Sunderland – Ryhope – Peterlee); 31A (Sunderland – Ryhope – Peterlee).

1 route operated by "Compass": 8X (Pennywell Road – South Hylton).

1 route operated by "Compass" / "Go North East": 37 / 137 (Doxford Park – Washington).

1 route operated by "ARRIVA" / "Go North East": 23A (Sunderland – Hartlepool).

1 route operated by "Go North East" / "VEOLIA": 36C (Sunderland – Hylton Castle – Sunderland).

As well interesting circuit routes served by individual major operators such as ARRIVA:

- Tyne and Wear Network Map / North East (by ARRIVA & "FWT", 17/11/2010) [371]; the Diagram is shown in the Figure 26.

- South East Northumberland network map / North East (by ARRIVA & "FWT", 19/11/2010) [372]; the Diagram is shown in the Figure 27.

- Durham Network Map / North East (by ARRIVA & "FWT", 19/11/2010) [373]; the Diagram is shown in the Figure 28.

Bus service further development is planned on the basis of such documents as:

- Bus Services in Tyne and Wear: Charter for Growth / Tyne and Wear Integrated Transport Authority and Nexus Bus Strategy (March, 2009) [36];
- Tyne & Wear Bus Corridor Improvement – Phase 1 (2010) [37].

Currently **Taxi service** in Tyne and Wear is run by 64 companies [374; 375; 376]:

NEWCASTLE-UPON-TYNE – 9 (A B C Taxis, Ace Taxis, Byker Waterline Taxis, Fenham Taxis, Metrocity Taxis, New Kenton & Kingston Cabs, New-Lem Taxis, Noda Taxis Ltd, Sunnyside Taxis);

GATESHEAD – 7 (Billquay Taxis, Century Taxis, Dean Taxis, Gateshead Taxis, Quayside Cars, T S G Taxis, Team Valley Taxis);

SUNDERLAND – 7 (A1 Taxis, B & B Cabs, Blue Arrow Taxi Co Ltd, Lakeside Association of Drivers, Northside Taxis, Roker View Taxis, Station Taxis Ltd);

SOUTH SHIELDS – 6 (Bridgeway Taxis, Dial A Cab, Marsden Taxis, Station Taxis, Westoe Taxis, Whitburn Taxis);

WANDERLAND – 5 (Battle Hill Taxis, Blue Line Taxis, East End Taxis, Flag Taxis, High View Taxis);

JARROW – 4 (Arrow Taxis, Bede Taxis, Greyhound, Viking Taxis);

WASHINGTON – 4 (A & F Concord, A1 Taxis, Diamond Taxis, Riverside Taxis);

HEBBURN – 3 (Elmfield Taxis, Express Taxis, Hebburn Taxis);

NORTH SHIELDS – 3 (Associated Taxis, Central Cabs, Tynemouth Taxis);

WHITLEY BAY – 3 (Brierdene Taxis, Foxhunters Taxis, North East Taxis);

BIRTLEY – 2 (Avenue & Tavern Taxis, Durham Road Cabs);

BLAYDON-ON-TYNE – 2 (Axwell Taxis, Blaydon Cab Co);

HOUGHTON-LE-SPRING – 2 (Ideal Taxis, Powell Taxis);

WHICKHAM – 2 (Craigs Taxis, Gateshead Central Taxis);

BENWELL – 1 (Benwell Taxis);

BOLDON – 1 (Boldon Taxis);

JESMOND – 1 (New Jes Taxis);

ROKER – 1 (Northside Taxis); RYTON – 1 (PT Cabs).

Taxis in Tyne and Wear provides customers with Taxis, Minicabs, Cabs, Airport Taxis & Transfers in Conurbation.

The **Parking service** is well developed in spite of the relatively low supply of cars families and individuals: "The Region has lower levels of household car ownership than other regions. 31% of households in the region do not own a car, compared with the national average of 24%" [3]. Comparable data is for motorcycles and bicycles.

Well-developed system of Parking services in different parts of the Conurbation. It corresponds to the current situation.

Newcastle-upon-Tyne Parking service (for example) consists of [377; 378; 379]:

The Car Facilities:

- Nine **MULTI-STOREY CAR PARKS** – Dean Street (259 parking spaces); Eldon Garden (430 parking spaces); Eldon Square (492 parking spaces); Finkle Street (74 parking spaces); Grainger Town (401 parking spaces); Manors (634 parking spaces); NUFC Stadium (588 parking spaces); Oxford (139 parking spaces); Quayside (499 parking spaces);
- Forty-seven **OFF STREET SURFACE CAR PARKS** – Akenside Hill (15 parking spaces); Algernon Road (52 parking spaces); Archbold Terrace Car (33 parking spaces); Argyle Street (55 parking spaces); Blandford Square (101 parking spaces); Blandford Street East (14 parking spaces); Castle Farm (39 parking spaces); Civic Centre (280 parking spaces); Claremont Road (221 parking spaces); Close Swing Bridge (38 parking spaces); Coach Lane (118 parking spaces); College Street (73 parking spaces); Cross Villa 4 (11 parking spaces); Denton Park CSC, Library And Pool (52 parking spaces); Ellison Place (119 parking spaces); Ellison Place East (5 Disabled Bays Only parking spaces); Friars (11 parking spaces); Gallowgate (73 parking spaces); Gosforth CSC, Library And Pool (58 parking spaces); Guildhall (22

parking spaces); Hancock Street (31 parking spaces); Heywood's Court (8 parking spaces); Kingston Park (93 parking spaces); Leazes Park (19 parking spaces); Leazes Park Road (50 parking spaces); Low Bridge; Merchants House (23 parking spaces); Mill House (11 parking spaces); Morden Street (107 parking spaces); Ord Street (13 parking spaces); Osborne Terrace (29 parking spaces); Painters Heugh (9 parking spaces); Prudhoe Street (5 parking spaces); Salters Road (81 parking spaces); Sandyford Road (21 parking spaces); Sandyford Square (71 parking spaces); Saville Place (42 parking spaces); Saint Georges (137 parking spaces); Saint James Metro (69 parking spaces); Saint James Street (15 parking spaces); Saint James (49 parking spaces); Saint Nicholas Avenue (70 parking spaces); Stoddart House (43 parking spaces); Strawberry Place (16 parking spaces); Strawberry Place East (18 parking spaces); Terrace Place South (60 parking spaces); Walkergate (24 parking spaces);

- **ON-STREET PARKING PROVISION:** Akenside Hill Pre, Archibald Street, Archbold Terrace, Back Newbridge Street, Barrack Road, Bath Lane, Bigg Market, Blackfriars Court, Blandford Square, Brandling Park, Brentwood Avenue, Broad Chare, Burdon Terrace, Carliol Square, Castle Garth, Charlotte Square, Chester Street, City Road, Claremont Road Lower, Claremont Road Upper, Clavering Arch, Clayton Street, Clayton Street West, College Street, Collingwood Street, Croft Street, Cross Street, Dean Street, Devonshire Terrace, Durant Road, Elmfield Road, Elsdon Road, Eskdale Terrace, Eslington Road, Eslington Terrace North, Falconar Street, Fenkle Street, Forth Banks, Forth Street, Friars, Grey Street, Groat Market, Heath Court, Hedley Street, Henry Street, High Bridge Square, Higham Place, Hood Street, Horatio Street, Hunters Road, Jesmond Road West, Kensington Terrace, King Street, Lambton Road, Leazes Crescent, Leazes Park Road, Leazes Terrace, Library Service Area, Lombard Street, Lyndhurst Avenue, Manor Chare, Market Street West, Market Street East, Marlborough Crescent, Melbourne Street, Newbridge Street, North Street, Northumberland Road Lower, Northumberland Road Upper, Nun Street, Ord Street, Osborne Avenue, Park Terrace, Portland Road East, Portland Road West, Pudding Chare, Quayside West, Quayside, Queens Road, Queen Street, Queen Victoria Road, Regent Avenue, Regent Road, Richardson Road Lower, Richardson Road Upper, Ridley Place, Rutherford Street, Sandyford Road, Scotswood Road, Shakespeare Street, Sheraton Street, Shield Street, The Side April, Saint Andrews Street Lower, Saint Andrews Street Upper, Saint James Street, Saint Nicholas Avenue, Saint John Street, Saint Nicholas Street, Saint Thomas Terrace, Stowell Street, Tankerville Terrace, Terrace Place, Thomas Bewick Square, Watergate, Waterloo Street, West Avenue, Westgate Road Upper, Westgate Road Lower, Windsor Terrace, Warwick Street, Worswick Street.

The Motorcycle Facilities (off Street):

- **STANDS IN MULTI-STOREY CAR PARK** – Dean Street (6 number of stands); Eldon Gardens (6 number of stands); Eldon Square (5 number of stands); Grainger Town (3 number of stands); Manors (2 number of stands); Oxford (2 number of stands); Quayside (3 number of stands);
- **STANDS IN SURFACE CAR PARKS** – Blandford Square (14 number of stands); Callerton Parkway (1 number of stands); Claremont Road (4 number of stands); Close/Swing Bridge (3 number of stands); Sandyford Square (2 number of stands); Saville Place (3 number of stands); Saint James Metro (4 number of stands);
- **BAYS IN SURFACE CAR PARKS** – Gallowgate (1 number of bays); Heywoods Court (1 number of bays); Kingston Park (1 number of bays); Leazes Park Road (1 number of bays); Morden Street (1 number of bays).

The Motorcycle Bays (on Street):

- Carlisle Square (with secure stand) Hood Street; College Street Kensington Terrace, Fenkle Street (with secure stand) Queen Street, Higham Place Westgate Hill.

The Cycle Stands (off Street):

- **STANDS IN MULTI-STOREY CAR PARK** – Grainger Town (8 number of stands); Manors (4 number of stands); Oxford (3 number of stands); Quayside (15 number of stands); Dean Street (9 number of stands); Eldon Garden (8 number of stands); Eldon Square (6 number of stands);
- **STAND IN SURFACE CAR PARK** – Callerton Park (8 number of stands); Kingston Park (6 number of stands);

The Cycle Lockers (off Street):

- **LOCKERS IN MULTI-STOREY CAR PARK** – Eldon Garden (10 number of lockers); Eldon Square (20 number of lockers); Grainger Town (10 number of lockers); Manors (5 number of lockers); Oxford (10 number of lockers); Dean Street (10 number of lockers).

The Parking service is partially integrated with the Metro network [35]:

- Park and Ride by Metro stations (11 points) – CALLERTON PARKWAY, BANK FOOT, EAST BOLDON, FELLGATE, FELLING, FOUR LANE ENDS, HEWORTH, KINGSTON PARK, REGENT CENTRE, NORTHUMBERLAND PARK, STADIUM OF LIGHT;
- Bicycle-lockers at Metro stations (12 points) – CHICHESTER, CALLERTON PARKWAY, EAST BOLDON, FELLING, FOUR LANE ENDS, GATESHEAD, HEWORTH, JARROW, NORTHUMBERLAND PARK, REGENT CENTRE, WEST MONKSEATON, WHITLEY BAY.

The Parking service for bikes, scooters and bicycles with integrated bus stops is very rare.

2.3 The Development of Integrated Public Transport Network creating ideas

Metro is a basic element of modern Public Transport system of the Tyne and Wear Conurbation. It was designed and built based on existing in the first half of the 19th century freight and passenger railroads. The development potential of this system is exhausted.

Creating such a system requires a thorough discussion of all the details of the project. In this respect interesting to trace the Development of modern ideas to improve Metro of Tyne and Wear.

One of the first proposals for the development of the network Metro was “**THE PLANNED TYNESIDE METRO LINE, 1969**” [380]: “The new TTB would run the new line as a metro service through the centre of the city once it opens – something planned for 1969”: Ponteland (*the Initial station / the Final station of the Route*) – Callerton Parkway – Bank Foot – Kingston Park – Fawdon – Wansbeck Road – Regent Centre – South Gosforth – Ilford Road – West Jesmond – Jesmond – Haymarket – Monument – Central Station (*the Hub*) – Gateshead – Gateshead Stadium – Felling – Heworth (*the Hub*) – Pelaw – Wardley – Sulgrave – Barmston – Fatfield – Harraton – Barley Mow – South Pelaw (*the Initial station / the Final station of the Route – the Hub*). The Branch from South Gosforth to Longbenton – Four Lane Ends – Benton – Forest Hill (*the Initial station / the Final station of the Route – the Hub*). The Branch from Pelaw to

Hebburn – Jarrow – Bede – Tyne Dock – Chichester – South Shields (*the Initial station / the Final station of the Route*).

Very interesting suggestions for tracing lines are given in “**PUBLIC TRANSPORT ON TYNESIDE – A PLAN FOR THE PEOPLE**” (Published in 1973) [381]. The diagram of the “POSSIBLE EXTENSION TO THE RAPID TRANSIT SYSTEM” shows:

- Lines of the “1979 R.T. system” – from KENTON GRANGE through SOUTH GOSFORTH, GATESHEAD, HEBBURN and TYNE DOCK to SOUTH SHIELDS; from SAINT JAMES through BYKER, NORTH SHIELDS and BENTON to SOUTH GOSFORTH.

- Branches of the “Possible extension to R.T. system” – from KENTON GRANGE to AIRPORT; from Benton to KILLINGWORTH; from SAINT JAMES to DENTON BURN; from BYKER to HEBBURN; from GATESHEAD through TEAM VALLEY to KIBBLESWORTH; from GATESHEAD through WASHINGTON, SOUTHWICK and SUNDERLAND to DOXFORD PARK; from TYNE DOCK through EAST BOLDON to SOUTHWICK.

- the Branch of the “Possible improved R.T. alignment” – from HEBBURN to TYNE DOCK.

- the Branch of the “Possible application of future technology” – from NORTH SHIELDS to SOUTH SHIELDS.

Metro lines under construction intensively. During the construction of individual sections of Metro were many proposals to build additional stations [382]: “There have been numerous suggestions for infill stations on the Metro since it opened, and five of these, *Pelaw, Kingston Park, Palmersville, Northumberland Park* and *Simonside* have been built [...]. Other plans that have been abandoned or are yet to be built: *BEACONSFIELD (between Tynemouth and Cullercoats)* [...]; *DORRINGTON ROAD (west of Fawdon)* [...]; *HIGH LANE ROW (between Hebburn and Jarrow)* [...]; *PALLION BRIDGE (between South Hylton and Pallion)* [...]; *STOTTS ROAD (between Walkergate and Wallsend)* [...]; *VICTORIA ROAD WEST (between Pelaw and Hebburn)*”.

In the early 1990s appears Project “**SUNDERLAND METRO EXTENSION**” (by “Steer Davies Gleave”, 1991) [383]. Interesting options 5, 6, 7, 8, 9 and 10:

- “OPTION 5 – Metro operation. PELAW – VICTORIA VIADUCT via Leamside Line. VICTORIA VIADUCT – SUNDERLAND” (Base Option, Variant 1, Variant 2, Variant 3) – 15 (7 for Metro Converted BR Line + 8 for New Metro Operation) new stations.

- “OPTION 6 – Metro / LRT operation. METRO: PELAW – A1290 via Leamside line. LRT: WASHINGTON – A1290 – SUNDERLAND” (Base Option, Variants) – 19 (5 for New Metro Operation + 14 for New LRT Operation) new stations.

- “OPTION 7. METRO: PELAW – A1290 via Leamside Line. LRT: ECML INTERCHANGE – WASHINGTON – A1290 – SUNDERLAND” (Base Option, Variant 1) – 25 (4 for Metro Converted BR Line + 21 for New LRT Operation) new stations.

- “OPTION 8 – LRT operation. GATESHEAD STADIUM – DURHAM ROAD – WASHINGTON A1231 – SUNDERLAND” (Base Option, Variant 1, Variant 2) – 27 new stations. Alternative Routes: Mount Pleasant – Birtley; Southwick – Sunderland.

- “OPTION 9 – LRT Operation. METRO CENTRE – GATESHEAD INTERCHANGE – DURHAM ROAD – WASHINGTON – A1231 – SUNDERLAND” (Base Option, Variants) – 28 new stations .

- “OPTION 10 – Metro Operation. PELAW – WASHINGTON via Leamside Line” (Base Option) – 8 (4 for New Metro Operation + 4 for Metro Converted BR Line) new stations.

THE PARTIAL INTEGRATION OF THE TYNE AND WEAR METRO WITH THE SEGMENT OF THE REGIONAL RAILWAY LANE (Route Map for the Metro; Mid-1990s) [384]:

The Metro Green line: Airport – Callerton Parkway (*Car Parking*) – Bank Foot (*Car Parking*) – Kingston Park (*Car Parking*) – Fawdon – Wansbeck Road – Regent Centre (*Car Parking*) – SOUTH GOSFORTH – Ilford Road – West Jesmond – Jesmond – Haymarket – MONUMENT – CENTRAL STATION – Gateshead – Gateshead Stadium – Felling – HEWORTH (*Car Parking*) – Pelaw – Hebburn – Jarrow (*Car Parking*) – Bede – Tyne Dock – Chichester – South Shields.

The Metro Yellow line: Saint James – MOMUMENT – Manors – Byker – Chillingham Road – Walkergate (*Car Parking*) – Wallsend – Hadrian Road – Howdon – Percy Main – Meadow Well – North Shields – Tynemouth (*Car Parking*) – Cullercoats – Whitley Bay (*Car Parking*) – Monkseaton – West Monkseaton – Shiremoor (*Car Parking*) – Palmersville – Benton (*Car Parking*) – Four Lane Ends (*Car Parking*) – Longbenton – SOUTH GOSFORTH – Ilford Road – West Jesmond – Jesmond – Haymarket – MONUMENT – CENTRAL STATION – Gateshead – Gateshead Stadium – Felling – HEWORTH (*Car Parking*) – Pelaw.

The British Rail: Sunderland – Seaham – East Boldon – Brockley Whins – HEWORTH (*Car Parking*) – (Walker New Bridge over River Tyne or Walker New Tunnel under River Tyne) – CENTRAL STATION – (The King Edward VII railway Bridge over River Tyne) – Metro Centre – to Hexham and Carlisle.

In 1997, it is assumed that by 2002 the Sunderland Metro line will be extended from South Hylton to Washington (4 stations) – **“TYNE & WEAR METRO IN 2002”**. – TDC, 1997 / Simon Bone, 1999 [385]. The Publication Author's comments: “Pelaw – South Hylton (Green Line) extension, four additional stations (Backworth, Beaconsfield are approved; High Lane Row, Simonside are planned), further Washington extension mentioned by Nexus”.

In the late 1990s and early 2000s developed the concept of an integrated public transport system. The basis of this system is Metro. It is developed by building new landlines of Segregated Bus, Tram, Superoute and Rail Development. One of the options is **“INDICATIVE LIGHT RAIL NETWORK”** (Newcastle Metro proposals. Modern Railways April 2002) [386]. The existing Metro lines are not changed. Between Palmersville station and Shiremoor station build the new station BACKWORTH (now it is “Northumberland Park” Metro station). At stations AIRPORT, REGENT CENTRE, FOUR LANE ENDS, PERCY MAIN, MONUMENT, GATESHEAD, SOUTH SHIELDS, SOUTH HYLTON interchange nodes are organized for new lines of “The Light Rail Network”. These lines form twelve routes.

Proposed Extensions ROUTE 1: Chowdene (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Retail Word (*the New station*), Team Valley (*the New station*), Dunston (*the New station*), The Metro Centre (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node / the Light Rail Interchange node*).

Proposed Extensions ROUTE 2: South Hylton (*the Existing Metro station / the New Light Rail station – the Initial station / the Final station of the Route – the Metro / the Light Rail Interchange node*), Washington Village (*the New station*), The Galleries (*the New station*), Sprigwell Village (*the New station*), Wrekenton, (*the New station*), Gateshead (*the Existing Metro station / the New Light Rail station – the Metro / the Light Rail Interchange node – the Initial station / the Final station of the Route 2 – the Initial station / the Final station of the Route 10*).

Proposed Extensions ROUTE 3: Ryhope (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Doxford Park (*the New station*), Herrington (*the New station*), Park Lane (*the Existing Metro station / the New Light Rail station*),

Sunderland (the Existing Metro station / the New Light Rail station – the Initial station / the Final station of the Route 3 – the Initial station / the Final station of the Route 4 – the Existing Rail Interchange node).

Proposed Extensions ROUTE 4: Sunderland (the Existing Metro station / New the Light Rail station – the Initial station / the Final station of the Route 4 – the Initial station / the Final station of the Route 3 – the Existing Rail Interchange node), Saint Peter's (the Existing Metro station / the New Light Rail station), Stadium of Light (the Existing Metro station / the New Light Rail station), Seaburn (the Existing Metro station / the New Light Rail station), East Boldon (the Existing Metro station / the New Light Rail station), Tyne Dock (the Existing Metro station / the New Light Rail station), Chichester (the Existing Metro station / the New Light Rail station), South Shields (the Existing Metro station / the New Light Rail station – the Initial station / the Final station of the Route 4 – the Initial station / the Final station of the Route 12 – the Existing Ferry Interchange node).

Proposed Extensions ROUTE 5: Percy Main (the Existing Metro station / the New Light Rail station – the Metro / the Light Rail Interchange node – the Initial station / the Final station of the Route), Backworth (the New Metro station / the New Light Rail station – the Metro / the Light Rail Interchange node – the Initial station / the Final station of the Route).

Proposed Extensions Route 6: The Branch of the Route 5 at the Rake Lane station (the New station – the Initial station / the Final station of the Route).

Proposed Extensions ROUTE 7: Four Lane Ends (the Existing Metro station / the New Light Rail station – the Metro / the Light Rail Interchange node – the Initial station / the Final station of the Route), Balliol (the New station), Killingworth (the New station – the Initial station / the Final station of the Route).

Proposed Extensions ROUTE 8: Airport (the Existing Metro station / the New Light Rail station – the Initial station / the Final station of the Route 8 – the Initial station / the Final station of the Route 9 – the Metro / the Light Rail Interchange node), three stations in the Newcastle Great Park area (new stations), Regent Centre (the Existing Metro station / the New Light Rail station – the Initial station / the Final station of the Route – the Metro / the Light Rail Interchange node).

Proposed Extensions ROUTE 9: Airport (the Existing Metro station / the New Light Rail station – the Initial station / the Final station of the Route 9 – the Initial station / the Final station of the Route 8 – the Metro / the Light Rail Interchange node), Callerton Parkway (the Existing Metro station / the New Light Rail station), Throckley (the New station – the Light Rail Interchange node – the Initial station / the Final station of the Route 9 – the Initial station / the Final station of the Route 10 – the Initial station / the Final station of the Route 11).

Proposed Extensions ROUTE 10: Throckley (the New station – the Light Rail Interchange node – the Initial station / the Final station of the Route 10 – the Initial station / the Final station of the Route 11 – the Initial station / the Final station of the Route 9), Newburn Hough (the New station), Blaydon (the New station), The Metro Centre (the New station – the Initial station / the Final station of the Route 1 – the Existing Rail Interchange node / the Light Rail Interchange node), Gateshead (the Existing Metro station / the New Light Rail station – the Metro / the Light Rail Interchange node – the Initial station / the Final station of the Route 10 – the Initial station / the Final station of the Route 2).

Proposed Extensions ROUTE 11: Throckley (the New station – the Light Rail Interchange node – the Initial station / the Final station of the Route 11 – the Initial station / the Final station of the Route 9 – the Initial station / the Final station of the Route 10), The District Centre (the New station), Saint James (the Existing Metro station / the New Light Rail station), Monument (the Existing Metro station / the New Light Rail station – the Metro / the Light Rail Interchange node), Manors (the Existing Metro station / the New Light Rail station), Byker (the Existing Metro station / the New Light Rail station), Walker (the New station – the Initial station / the Final station of the Route).

Proposed Extensions ROUTE 12: South Shields (the Existing Metro station / the Light Rail station – the Initial station / the Final station of the Route 12 – the Initial station / the Final station of the Route 4 – the Existing Ferry Interchange node), Westoe (the New station), Marsden (the New station – the Initial station / the Final station of the Route).

An important place in the history of development concepts of Conurbation Public Transport occupies “Project Orpheus”. The project involves expansion of the Metro at the expense of Trams. Part of the bus services are integrated with an extensive Metro-Tram network: “Trams can run on the existing Metro system with Metro trains and therefore we can make very good use of the existing tracks, tunnels, stations and bridges when introducing new tram routes; As trams can run on Metro tracks when the trams join the existing system passengers can stay on the tram and ride through to the Center of, for example, Newcastle (they do not have to change to a Metro train to finish their journey) and there will be no need to build expensive new tracks and stations in City Center currently served by Metro; Trams systems are cheaper to build and operate than Metro systems; As they are cheaper and can run on street we can look to run trams to areas where it would be impossible to operate Metro” [387].

2003 – PROJECT ORPHEUS. – Options for Corridors Considered Unsuitable as Metro Extensions During Phase 1A of Project Orpheus. Final Report / by Nexus / Consultants: Steer Davies Gleave; Jacobs GIBB. (May, 2003) [388]:

“The Superoute Network – Phase 1” – this is a coordinated system of bus lines and metro lines.

“Purpose-built transport interchange”: Regent Centre, NEWCASTLE CENTRAL STATION, Wallsend, North Shields, Gateshead, Heworth, South Shields, SUNDERLAND STATION.

“Possible interchange between Bus and Metro”: Monkseaton, Whitley Bay, Cullercoats, Tynemouth, Meadow Well, Walkergate, Chillingham Road, Byker, Gateshead Stadium, Felling, Seaburn, University.

The Initial stop / the Final stop of Bus routes: Blyth, Cramlington, Whitley Bay Seafront, Metro Centre, South Shields, Silksworth, Doxford International Business Park, South Hetton, Durham, Darlington, Bishop Auckland.

Ordinary Bus stops:

- Dudley, Seaton Burn, Wideopen, Brunton Park, Great North Road;
- Cowgate, Blakelaw, Newbiggin Hall Estate;
- Rosenhill, High Howdon, Chirton, West Chirton, New York, North Tyneside Hospital, Cullercoats Seafront, Marden Estate;
- Bensham, Lobley Hill, Whickham, Grange Estate, Saltwell Park, Coatsworth Road;
- Low Fell, Birtley, Barley Mow, Chester-le-Street, Fence Houses, Houghton-le-Spring, Hall Lane Estate, East Rainton;
- Queen Elizabeth Hospital, Beacon Lough, Wrekenton, Springwell Estate, Whitehills Estate, Leam Lane Estate, High Lanes, Colegate;
- Lingey Lane, Concord, Albany, Washington Galleries, Fatfield, Newbottle, Hetton-le-Hole, Easington Lane;
- Westoe, Harton Nook, Cleadon, Fulwell Grange, Monkwearmouth, Silksworth;
- Sunderland Royal Hospital, Pennywell, Barnes Park, East Herrington.

2003 – Project Orpheus. Building on success. – Project Orpheus. Phase 1A. Summary Report / by Nexus / Consultants: Ernst &Young LLP; Steer Davies Gleave; JacobsGIBB (May, 2003) [389]: “Schematic Map showing the Ten Corridors going through to Phase 1B Analysis” – **“ORPHEUS ROUTES”**.

THE TRAM ROUTE 1: Sunderland (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Ryhope (*the New station – the Existing Rail Interchange node*), Seaham (*the New station – the Initial station / the Final station of the Route*).

THE TRAM ROUTE 2: Sunderland (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Park Lane (*the Existing Metro station – the New Interchange node*), Doxford Park (*the New station*), Ryhope (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*).

THE TRAM ROUTE 6: Pallion (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Washington (*the New station*), Wrekenton (*the New station – the Initial station / the Final station of the Route – the New Interchange node*).

THE TRAM ROUTE 8: Wrekenton (*the New station – the Initial station / the Final station of the Route – the New Interchange node*), RING, Gateshead (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*).

THE TRAM ROUTE 9: Team Valley (*the New station – the Initial station / the Final station of the Route*), Teams (*the New station – the Initial station / the Final station of the Route – the New Interchange node*).

THE TRAM ROUTE 12: South Shields (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Ferry Interchange node*), Chichester (*the Existing Metro station – the New Interchange node*), Tyne Dock (*the Existing Metro station – the New Interchange node*), East Boldon (*the Existing Metro station – the New Interchange node*), Seaburn (*the Existing Metro station – the New Interchange node*), Stadium of Light (*the Existing Metro station – the New Interchange node*), Saint Peter's (*the Existing Metro station – the New Interchange node*), Sunderland (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*).

THE TRAM ROUTE 19: Gateshead (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Teams (*the New station – the New Interchange node*), MetroCentre (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*).

THE TRAM ROUTE 21A: Denton (*the New station – the New Interchange node – the Initial station / the Final station of the Route*), Walbottle (*the New station – the Initial station / the Final station of the Route*).

THE TRAM ROUTE 21B: MetroCentre (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Denton (*the New station – the New Interchange node – the Initial station / the Final station of the Route*).

THE TRAM ROUTE 21: Denton (*the New station – the Initial station / the Final station of the Route – the New Interchange node*), District Centre (*the New station*), Saint James (*the Existing Metro station – the New Interchange node*), Monument (*the Existing Metro station – the New Interchange node – the Initial station / the Final station of the Route*).

THE TRAM ROUTE 23: Four Lane Ends (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Killingworth (*the New station*), Cramlington (*the New station – the Initial station / the Final station of the Route*).

THE TRAM ROUTE 28: Monument (*the Existing Metro station – the New Interchange node – the Initial station / the Final station of the Route*), Manors (*the Existing Metro station – the New Interchange node*), Byker (*the Existing Metro station – the New Interchange node*), Walker (*the New station – the Initial station / the Final station of the Route*).

All routes are provided for the “Orpheus Concept”, shown in Scheme “**PROJECT ORPHEUS CORRIDOR RECOMMENDATIONS**” [390]: EXISTING METRO LINES (60 stations

with 7 Metro Interchange Stations: Monument, South Gosforth, Four Lane Ends, Percy Main, Gateshead, Pelaw and South Shields).

TRAM LANES (routes 1, 2, 9, 12, 19, 21, 21a, 21b, 23 and 28):

*the Route 1 – Sunderland (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Ryhope (*the New station – the Existing Rail Interchange node*), Seaham (*the New station – the Initial station / the Final station of the Route*).

*the Route 2 – Sunderland (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Park Lane (*the Existing Metro station – the New Interchange node*), Barnes Park (*the New station*), Doxford Park (*the New station*), Tunstall (*the New station*), Ryhope (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*).

*the Route 9 – Team Valley (*the New station – the Initial station / the Final station of the Route*), Bensham (*the New station*), Teams (*the New station – the Initial station / the Final station of the Route – the New Interchange node*).

*the Route 12 – South Shields (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Ferry Interchange node*), Chichester (*the Existing Metro station – the New Interchange node*), Tyne Dock (*the Existing Metro station – the New Interchange node*), East Boldon (*the Existing Metro station – the New Interchange node*), Seaburn (*the Existing Metro station – the New Interchange node*), Stadium of Light (*the Existing Metro station – the New Interchange node*), Saint Peter's (*the Existing Metro station – the New Interchange node*), Sunderland (*the Existing Metro station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*).

*the Route 19 – Gateshead (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Teams (*the New station – the New Interchange node*), MetroCentre (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*).

*the Route 21 – Denton (*the New station – the Initial station / the Final station of the Route – the New Interchange node*), District Centre (*the New station*), Saint James (*the Existing Metro station – the New Interchange node*), Monument (*the Existing Metro station – the New Interchange node – the Initial station / the Final station of the Route*).

*the Route 21a – Denton (*the New station – the New Interchange node – the Initial station / the Final station of the Route*), Walbottle (*the New station – the Interchange node – the Initial station / the Final station of the Route*).

*the Route 21b – MetroCentre (*the New station – the Initial station / the Final station of the Route – the Existing Rail Interchange node*), Denton (*the New station – the New Interchange node – the Initial station / the Final station of the Route*).

*the Route 23 – Four Lane Ends (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Killingworth (*the New station – the Interchange node*), Cramlington (*the New station – the Initial station / the Final station of the Route*).

*the Route 28 – Monument (*the Existing Metro station – the New Interchange node – the Initial station / the Final station of the Route*), Manors (*the Existing Metro station – the New Interchange node*), Byker (*the Existing Metro station – the New Interchange node*), Walker (*the New station – the Initial station / the Final station of the Route*).

SEGREGATED BUS LANES (routes 6, 8, 10, 15, 22 and 26):

*the Route 6 – Pallion (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Town End Farm (*the New station – the Interchange node*), East Washington (*the New station – the Initial station / the Final station of the Route – the New Interchange node*).

*the Route 8 – Gateshead (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Queen Elisabeth Hospital (the New station), Washington Town Centre (the New station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 10 – Heworth (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), East Washington (the New station – the Interchange node), Washington Town Centre (the New station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 15 – Tyne Dock (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Brockley Whins (the Existing Metro station – the New Interchange node), Town End Farm (the New station – the Initial station / the Final station of the Route – the Interchange node).

*the Route 22 – Airport (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Great North Park (the New station), Regent Centre (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 26 – Backworth / Northumberland Park (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), West Chirton (the New station – the New Interchange node), Percy Main (the Existing Metro station – the New Interchange node), Port (the New station – the Initial station / the Final station of the Route – the Existing Ferry Interchange node).

SUPERROUTE LANES (routes 3, 4, 7, 11, 14, 16, 17, 20, 24, 27 and 29):

*the Route 3 – Seaham (the New station – the Initial station / the Final station of the Route – the New Interchange node), Murton (the New station), Hetton-le-Hole (the New station), Houghton-le-Spring (the New station), Doxford Park (the New station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 4 – Doxford Park (the New station – the Initial station / the Final station of the Route – the New Interchange node), Biddick (the New station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 7 – Chester-le-Street (the New station – the Initial station / the Final station of the Route), Biddick (the New station – the New Interchange node), Washington Town Centre (the New station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 11 – Washington Town Centre (the New station – the Initial station / the Final station of the Route – the New Interchange node), Heworth (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 14 (the Ring) – South Shields (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node – Existing Ferry Interchange node), Chichester (the Existing Metro station – the New Interchange node), Harton (the New station), Marsden (the New station), South Shields (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node – Existing Ferry Interchange node).

*the Route 16 – Stanley (the New station – the Initial station / the Final station of the Route), Sunniside (the New station), Whickham (the New station), MetroCentre (the Existing Rail station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 17 – Consett (the New station – the Initial station / the Final station of the Route), Rowlands Gill (the New station), Swalwell (the New station), Blaydon (the New station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 20 – Airport (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Walbottle (the New station – the New Interchange node), Blaydon (the New station – the New Interchange node), MetroCentre (the New station – the New Interchange node), Teams (the New station – the New Interchange node), Gateshead (the

Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 24 – Airport (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Great Northern Park (the New station – the New Interchange node), Gosforth Park (the New station), Killingworth (the New station – the Initial station / the Final station of the Route – the New Interchange node), Backworth / Northumberland Park (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 27 – Monument (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Haymarket (the Existing Metro station – the New Interchange node), Heaton (the New station – the New Interchange node), West Chirton (the New station – the New Interchange node), Billy Mill (the New station), Whitley Bay (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node).

*the Route 29 – Four Lane Ends (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node), Heaton (the New station – the New Interchange node), Byker (the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node).

RAIL DEVELOPMENT LANES (routes 5, 18 and 25):

*the Route 5 – South Hylton (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Leamside Lane (*Possible connection*).

*the Route 18 – Central Station (*the Existing Metro station – the Existing Rail station – the Initial station / the Final station of the Route – the New Interchange node*), MetroCentre (*the Existing Rail station – the New Interchange node*), Prudhoe (*the New station – the Initial station / the Final station of the Route*).

*the Route 25 – Backworth / Northumberland Park (*the Existing Metro station – the Initial station / the Final station of the Route – the New Interchange node*), Newsham (*the Existing Rail station*), Badlington Station (*the Existing Rail station*), Ashington (*the Existing Rail station*).

In the mid-2000s **FURTHER DEVELOPMENT** is assumed as follows [391]. The Publication Author's comments: "Yellow, Green - existing Metro lines run by Nexus. Black - Tyne passenger ferry run by Nexus. Dark grey - proposed extensions on existing rail lines. Light grey - proposed extensions requiring new track. [...] In 2002 Nexus unveiled Project Orpheus, an expansion plan that would extend the Metro system by adding new sections using street running, thus changing the nature of the Metro to a supertram-like system. [...] The plan listed a number of routes, not all of which were to be built as rail lines; transitional bus services were envisioned that could be replaced by trams as demand increased. [...] Another project, to remove the last section of single track in the Metro system, between Pelaw and Bede, [...] would allow freight trains to use the Metro infrastructure [...]. Among extensions proposed at various times: Washington, either via the disused Leamside Line or a new route [...]; Blyth & Ashington, running on existing little-used freight lines [...]; Tyne Dock to East Boldon along a dismantled railway alignment could easily be added, as only a short distance lies between two Metro lines [...]; Killingworth and Cramlington have been planned since Metro was on the drawing board, but would require widening of the busy East Coast main line to four tracks, which would be expensive; Newcastle's west end would require entirely new track involving tunneling and bridging in hilly terrain [...]; Ryhope, in southern Sunderland, has been mooted as an extension using existing railway lines. Project Orpheus also went to Ryhope, but using a different route".

Gradually, the activity of new proposals has decreased, and the debate about the directions of further development of the Tyne and Wear Metro stop. Periodically appearing publications on the history of the Metro is not of great interest to the Public. Renewed interest in

the topic of Metro is already in the second half of the 2000s. New ideas are once again attracting Public attention to the problem of Public Transport improving. The end of the 2000s - the beginning of the 2010s was a period of intensive study opportunities for further development of the Metro. Constantly evolving new ideas and proposals are being actively discussed in the media. Panel discussion attracted public attention.

After a nearly three-year hiatus debate about the directions of further development of **METRO RESUMED FORMING BRANCHES IDEA**: "Salif" – "Skyscrapercity.com" Registered User (January 21st, 2007) [392]. The development of Metro network is proposed in the following areas:

1. From "Four Lane Ends" over "Balliol" and "Killingworth" to "Cramlington".
2. From "Saint James Park" over "District Centre" – "Denton" – "Walbottle" to "Newcastle Airport".
3. From "Denton" over "The Metro Centre" and "Dunston" to "Gateshead".
4. From "Dunston" over "Bensham" to "Team Valley".
5. From "Sunderland - Park Lane" over "Barnes Park" – "Doxford Park" – "Tunstall" to "Ryhope".
6. From "Gateshead" over "The Queen Elizabeth Hospital" – "Wrekenton" – "The Washington Town Centre" – "East Washington" to "Sunderland – Pallion".
7. From "East Boldon" to "Tyne Dock".
8. From "Byker" to "Walker".
9. From "Saint James Park" over "West End" and "Gateshead" to "Washington" and "Sunderland".

TYNE AND WEAR METRO – "DEVELOPMENT IDEAS", 2007 (by "Johnnypd" – "Skyscrapercity.com" Registered User. – April 1-2, 2007) [393]. The Development of Metro network is proposed in the following areas:

1. The new Red Ring lane – from "Saint James" (*the Existing station – the Initial station / the Final station of the Route*) over "Westgate Hill" (*the New station*) – "The Central Hospital" (*the New station*) – "Fenham" (*the New station*) – "Denton Grove" (*the New station*) – "Lemington" (*the New station*) – "The Blaydon Interchange" (*the New station*) – "The Metro Centre" (*the New station*) – "Dunston" (*the New station*) – "Bensham" (*the New station*) to "The Central Station" (*the Existing station – the Initial station / the Final station of the Route*).
2. The Green lane (*the new Branch*) – from "Sunderland" (*the Existing station – the Initial station / the Final station of the Route*) over "Gray Road" (*the New station*) – "Percy Terrace" (*the New station*) – "Ryhope" (*the New station*) to "Seaham" (*the New station – the Initial station / the Final station of the Route*).

"DEVELOPMENT IDEAS – THE ADDITION". – April 2, 2007. In addition to proposals for the Development of April 1, 2007 the new Blue lane: from "Airport" (*the Existing station – the Initial station / the Final station of the Route*) over "Westerhope" (*the New station*) – "Blakelaw" (*the New station*) – "Wingrove Road" (*the New station*) – "The Central Hospital" (*the New station – Interchange node between the Blue lane and the Red lane*) – "Elswick" (*the New station*) – "Hill" (*the New station*) – "Arena" (*the New station*) to "The Central Station" (*the Existing station – the Initial station / the Final station of the Route*).

"NORTHUMBERLAND – TYNE AND WEAR – DURHAM CROSSRAIL IDEA", October 17th, 2007 (by "Johnnypd" – "Skyscrapercity.com" Registered User) [394]. The Idea Author's comments: "Here is an idea i came up with for a Tyne and Wear crossrail. There's more stations south of the Tyne as these some of these areas aren't currently served by light rail or the metro, so it is a good opportunity to link them up, while saving the northern portion for express routes.

Haven't included Sunderland in this yet, nor an express route to the Airport, but they would also be included, along with perhaps including the Ryton-Metro-centre NR line, while a westward loop to take in the west end of Newcastle would be an extension to the metro proper. [...] Metro station trains coming from Cramlington and beyond would link into, I think it is Northumberland Park, but I'm not sure". The Drawing shows Main Long lane with two branches: SEAHAM – HETTON-LE-HOLE – HOUGHTON-LE-SPRING – PENSHAW – WASHINGTON (the Interchange node for CHESTER-LE-STREET branch) – WREKENETON – LOW FELL – BENSHAM – GATESHEAD – NEWCASTLE (the Hub) – SOUTH GOSFORTH – NORTHUMBERLAND PARK – CRAMLINGTON (the Interchange node for MORPETH branch) – BLYTH – BEDLINGTON – ASHINGTON.

"This was from the original Metro thread from last year" (by "Sterock 85" – "Skyscrapercity.com" Registered User. – October, 10, 2008) [395]. The compound of Yellow and Green lines – the North Branch of the Green Lane (*1 new station*): South Shields (*the Existing station – Interchange node between the Yellow lane and the Green lane new branch*) – Chichester (*the Existing station – Interchange node between the Yellow lane and the Green lane new branch*) – Tyne Dock (*the Existing station – Interchange node between the Yellow lane and the Green lane new branch*) – Green Lane (*the New station*) – East Boldon (*the Existing station – Interchange node between the Main Green lane and the Green lane new branch*). The South Branch of the Green Lane (*6 new stations*): Sunderland (*the Existing station – Interchange node between the Main Green lane and the Green lane new branch*) – Gray Road (*the New station*) – Hendon (*the New station*) – Grangetown (*the New station*) – Leechmere (*the New station*) – Ryhope (*the New station*) – Seaham (*the New station – the Initial station / the Final station of the Route*).

THE EXTENDED METRO INTEGRATION WITH THE LOCAL RAIL NETWORK (by "u k – h i g h s p e e d" (Paul Durose) – "Skyscrapercity.com" Registered User. – January 12, 2009) [396; 397]. The Idea Author's comments: "Here's just some ideas of my own re proposed or possible routes – not so much an extension to the Metro but a local rail network to cover the North Tyneside – South East Northumberland area, plus one or two other extensions and ideas. Nothing is included to the West End of Newcastle as I don't see extending the St James tunnels as viable, plus it probably needs something more extensive like a modern tram system or similar."

"GREEN – Airport Line (including extension south Sunderland, along existing National Rail route)."

"YELLOW – Coast & City Line. Hadrian Line."

"RED – New Line to Metro Centre & Blaydon (partly using existing National Rail tracks; partly new tunnel under Gateshead)." "BLUE – New Line from Sunderland to South Shields (using existing freight line between the Sunderland line and South Shields line); (incorporating existing line from South Hylton with an extension to Washington on former rail route)."

VIOLET "POSSIBLE FURTHER METRO EXTENSIONS. West Newcastle Line (Mostly new route with tunnel sections show dashed. Partly using existing alignment along former rail route to west Newcastle Central Station). Washington Line (Partly using National Rail route; partly new route including tunnel section under Washington)."

BROWN "NATIONAL RAIL: MAIN LINE SERVICES. Proposed High-Speed Line."

ORANGE "NORTHERN RAIL SERVICES (including re-opened Leamside Line via Washington, and several new stations)."

CELADON "NORTH TYNESIDE & SOUTH-EAST NORTHUMBERLAND RAILWAY. New network using existing freight lines and former rail routes."

GRAY "POSSIBLE FURTHER LOCAL RAIL EXTENSIONS – South Washington line (using former rail route)."

“NORTHUMBERLAND – TYNE AND WEAR – DURHAM RAIL SYSTEM PROPOSALS – 2009” (by “Tyr” – “Skyscrapercity.com” Registered User. – July 28, 2010; “Newcastlemetro.blogspot.com” Registered User) [398; 399].
THE FIRST VARIANT.

“The Brown branch” at the Scheme – from MIDDLESBROUGH via HARTLEPOOL and SUNDERLAND to NEWCASTLE: Middlesbrough (*the Major National Rail station – the Tees Valley Metro station*) – Thornaby (*the Tees Valley Metro station*) – Stockton (*the Tees Valley Metro station*) – Billingham (*the Tees Valley Metro station*) – Seaton Carew (*the Tees Valley Metro station*) – Hartlepool (*the Major National Rail station*) – Headland (*the Tees Valley Metro station*) – Blackhall (*the North East Commuter Rail station*) – Peterlee (*the North East Commuter Rail station*) – Easington Colliery (*the North East Commuter Rail station*) – Seaham (*the North East Commuter Rail station*) – Leechmere (*the Tyne and Wear Metro station*) – Sunderland (*the Major National Rail station – the Tyne and Wear Metro station*) – Seaburn (*the Tyne and Wear Metro station*) – Brockley Whins (*the Tyne and Wear Metro station*) – Heworth (*the Tyne and Wear Metro station*) – Gateshead Stadium (*the Tyne and Wear Metro station*) – Newcastle Central (*the Major National Rail station – the Tyne and Wear Metro station – the Initial station / the Final station of the Route*).

“The Violet branch” at the Scheme – from MIDDLESBROUGH via DARLINGTON, DURHAM and NEWCASTLE to ASHINGTON: Middlesbrough (*the Major National Rail station – the Tees Valley Metro station*) – Thornaby (*the Tees Valley Metro station*) – Eaglescliffe (*the Tees Valley Metro station*) – Durham Tees Valley Airport (*the Tees Valley Metro station*) – Darlington (*the Major National Rail station*) – Harrowgate Hill (*the North East Commuter Rail station*) – Aycliffe (*the North East Commuter Rail station*) – Ferryhill (*the North East Commuter Rail station*) – Spennymoor (*the North East Commuter Rail station*) – Langley Moor (*the North East Commuter Rail station*) – Durham (*the Major National Rail station*) – Framwellgate Moor (*the North East Commuter Rail station*) – Chester-le-Street (*the Tyne and Wear Metro station*) – North Lodge (*the Tyne and Wear Metro station*) – Low Fell (*the Tyne and Wear Metro station*) – Bensham (*the Tyne and Wear Metro station*) – Newcastle Central (*the Major National Rail station – the Tyne and Wear Metro station*) – Manors (*the Tyne and Wear Metro station*) – Chillingham Road (*the Tyne and Wear Metro station*) – Little Benton (*the Tyne and Wear Metro station*) – Palmersville (*the Tyne and Wear Metro station*) – Seghill (*the North East Commuter Rail station*) – Newsham (*the North East Commuter Rail station*) – Blyth (*the North East Commuter Rail station*) – Bedlington (*the North East Commuter Rail station*) – South Ashington (*the North East Commuter Rail station*) – Ashington (*the North East Commuter Rail station*).

THE SECOND VARIANT (*Version with many stations*).

“The Brown branch” at the Scheme – from MIDDLESBROUGH via HARTLEPOOL and SUNDERLAND to NEWCASTLE: Middlesbrough (*the Major National Rail station – the Tees Valley Metro station*) – Teeside Park (*the Tees Valley Metro station*) – Thornaby (*the National Rail station – the Tees Valley Metro station*) – Stockton (*the National Rail station – the Tees Valley Metro station*) – South Norton (*the Tees Valley Metro station*) – North Norton (*the Tees Valley Metro station*) – Billingham (*the National Rail station – the Tees Valley Metro station*) – Queens Meadow (*the Tees Valley Metro station*) – Seaton Carew (*the National Rail station – the Tees Valley Metro station*) – Hartlepool (*the Major National Rail station – the Tees Valley Metro station*) – Headland (*the Tees Valley Metro station*) – Hart (*the Tees Valley Metro station*) – Blackhall (*the North East Commuter Rail station*) – Peterlee (*the North East Commuter Rail station*) – Easington Colliery (*the North East Commuter Rail station*) – Seaham (*the National Rail station / the North East Commuter Rail station – the Tyne and Wear Metro station*) – Leechmere (*the Tyne and Wear Metro station*) – Grangetown (*the Tyne and Wear Metro station*) – Percy Terrace (*the Tyne and Wear Metro station*) – Mowbray Road (*the Tyne and Wear Metro station*) –

Sunderland (the Major National Rail station – the Tyne and Wear Metro station) – Saint Peter's (the Tyne and Wear Metro station) – Stadium of Light (the Tyne and Wear Metro station) – Seaburn (the Tyne and Wear Metro station) – East Boldon (the Tyne and Wear Metro station) – Brockley Whins (the Tyne and Wear Metro station) – Fellgate (the Tyne and Wear Metro station) – Pelaw (the Tyne and Wear Metro station) – Heworth (the Tyne and Wear Metro station) – Felling (the Tyne and Wear Metro station) – Gateshead Stadium (the Tyne and Wear Metro station) – Newcastle Central (the Major National Rail station – the Tyne and Wear Metro station – the Initial station / the Final station of the Route).

“The Violet branch” at the Scheme – from MIDDLESBROUGH via DARLINGTON, DURHAM and NEWCASTLE to ASHINGTON: Middlesbrough (the Major National Rail station – the Tees Valley Metro station) – Teeside Park (the Tees Valley Metro station) – Thornaby (the National Rail station – the Tees Valley Metro station) – Eaglescliffe (the National Rail station – the Tees Valley Metro station) – Allens West (the national Rail station – the Tees Valley Metro station) – Durham Tees Valley Airport (the National Rail station – the Tees Valley Metro station) – Dinsdale (the National Rail station – the Tees Valley Metro station) – Morton Palms (the National Rail station – the Tees Valley Metro station) – Darlington (the Major National Rail station) – Harrowgate Hill (the North East Commuter Rail station) – Aycliffe (the North East Commuter Rail station) – Ferryhill (the North East Commuter Rail station) – Spennymoor (the North East Commuter Rail station) – Langley Moor (the North East Commuter Rail station) – Durham (the Major National Rail station) – Framwellgate Moor (the North East Commuter Rail station) – Chester-le-Street (the National Rail station / the North East Commuter Rail station) – North Lodge (the North East Commuter Rail station) – Chowdene (the Tyne and Wear Metro station) – Low Fell (the Tyne and Wear Metro station) – Saltwell (the Tyne and Wear Metro station) – Bensham (the Tyne and Wear Metro station) – Redheugh (the Tyne and Wear Metro station) – Newcastle Central (the Major National Rail station – the Tyne and Wear Metro station) – Manors (the Tyne and Wear Metro station) – Jesmond Vale (the Tyne and Wear Metro station) – Chillingham Road (the Tyne and Wear Metro station) – Benfield (the Tyne and Wear Metro station) – Little Benton (the Tyne and Wear Metro station) – Palmersville (the Tyne and Wear Metro station) – Seghill (the North East Commuter Rail station) – Newsham (the North East Commuter Rail station) – Blyth (the North East Commuter Rail station) – Bedlington (the North East Commuter Rail station) – South Ashington (the North East Commuter Rail station) – Ashington (the North East Commuter Rail station).

This idea is THE COMBINATION OF THE TYNE & WEAR METRO AND THE TEES VALLEY METRO WITH THE NORTH EAST COMMUTER RAIL [400; 401]. Such the Scheme that is successfully operating in Germany – Light Rail Networks in the Rhine-Ruhr Area / Rhein-Ruhr Stadtbahn: Düsseldorf, Duisburg, Mülheim, Oberhausen & Essen [402].

Possible of Tyne and Wear Metro Extensions – 2009 “DREAM” (by “Tyr” – “Skyscrapercity.com” Registered User. – July 23, 2009) [403]. The proposed scheme forms the five rings (in the Scheme are marked in Green, Yellow, Blue, Violet and Red colors). The Green Ring lane and the Yellow Ring lane located northern of the River Tyne. The Violet Ring lane and the Red Ring lane are located southern of the River Tyne and cross the River Wear. The Blue Ring lane crosses the River Tyne. The Green Ring lane, the Yellow Ring lane, the Blue Ring lane and Violet Ring lane touch. The Violet Ring lane and the Red Ring lane touch in two places and cross at two locations.

THE GREEN RING (23 stations): Monument (the Existing station – the Interchange node for the Yellow lane and the Blue lane – the Initial station / the Final station of the Route: conditionally) – Haymarket (the Existing station – the Interchange node for the Yellow lane) – Jesmond (the Existing station – the Interchange node for the Yellow lane) – West Jesmond (the Existing station – the Interchange node for the Yellow lane) – Ilford Road (the Existing station –

the Interchange node for the Yellow lane) – South Gosforth (the Existing station – the Interchange node for the Yellow lane) – Regent Centre (the Existing station) – Wansbeck Road (the Existing station) – Fawdon (the Existing station) – Kingston Park (the Existing station) – Bank Foot (the Existing station) – Callerton Parkway (the Existing station) – Airport (the Existing station) – Ponteland (the New station) – Darras Hall (the New station) – Walbottle (the New station) – Chapel Park (the New station) – Westerhope (the New station) – Blakelaw (the New station) – Cowgate (the New station) – Fenham (the New station) – Central Hospital (the New station – the Interchange node for the Blue lane) – Saint James (the Existing station – the Interchange node for the Blue lane) – Monument (the Existing station – the Interchange node for the Yellow lane and the Blue lane – the Initial station / the Final station of the Route: conditionally).

THE YELLOW RING (29 stations): Monument (the Existing station – the Interchange node for the Green lane and the Blue lane – the Initial station / the Final station of the Route: conditionally) – Haymarket (the Existing station – the Interchange node for the Green lane) – Jesmond (the Existing station – the Interchange node for the Green lane) – West Jesmond (the Existing station – the Interchange node for the Green lane) – Ilford Road (the Existing station – the Interchange node for the Green lane) – South Gosforth (the Existing station – the Interchange node for the Green lane) – Longbenton (the Existing station) – Four Lane Ends (the Existing station) – Benton (the Existing station) – Palmersville (the Existing station) – Northumberland Park (the New station) – Shiremoor (the Existing station) – West Monkseaton (the Existing station) – Monkseaton (the Existing station) – Whitley Bay (the Existing station) – Cullercoats (the Existing station) – Long Sands (the New station) – South Tynemouth (the Existing renamed station) – North Shields (the Existing station) – Meadow Well (the Existing station) – Percy Main (the Existing station) – Howdon (the Existing station) – Hadrian Road (the Existing station) – Wallsend (the Existing station) – Walkergate (the Existing station) – Chillingham Road (the Existing station) – Byker (the Existing station) – Shieldfield (the New station) – Manors (the Existing station) – Monument (the Existing station – the Interchange node for the Green lane and the Blue lane – the Initial station / the Final station of the Route: conditionally).

THE BLUE RING (14 stations): Monument (the Existing station – the Interchange node for the Green lane and the Yellow lane – the Initial station / the Final station of the Route: conditionally) – Central Station (the Existing station) – Gateshead Interchange (the Existing station – the Interchange node for the Violet lane) – Shipcole (the New station – the Interchange node for the Violet lane) – Bensham (the New station) – Team Valley North (the New station) – Dunston (the New station) – Metro Centre (the New station) – Blaydon (the New station) – Scotswood (the New station) – Benwell (the New station) – Elswick (the New station) – Central Hospital (the New station – the Interchange node for the Green lane) – Saint James (the Existing station – the Interchange node for the Green lane) – Monument (the Existing station – the Interchange node for the Yellow lane and the Green lane – the Initial station / the Final station of the Route: conditionally).

THE VIOLET RING (28 stations): Gateshead Interchange (the Existing station – the Interchange node for the Blue lane – the Initial station / the Final station of the Route: conditionally) – Shipcole (the New station – the Interchange node for the Blue lane) – Low Fell (the New station) – Beacon Lough (the New station) – Wrenkenton (the New station) – Springwell (the New station) – Blackfell (the New station) – Oxclose (the New station) – The Galleries (the New station) – Washington Village (the New station) – Columbia (the New station) – Fatfield (the New station) – South Hylton (the Existing station – the Interchange node for the Red lane) – Pallion (the Existing station) – Millfield (the Existing station) – University (the Existing station) – Park Lane (the Existing station) – Sunderland Central (the Existing station – the Interchange node for the Red lane) – Saint Peter's (the Existing station – the Interchange node for the Red lane) – Stadium of Light (the Existing station – the Interchange node for the Red lane) – Seaburn (the Existing station) – East Boldon (the Existing station) – Brockley Whins (the

Existing station) – Fellgate (the Existing station – the Interchange node for the Red lane) – Pelaw (the Existing station – the Interchange node for the Red lane) – Heworth (the Existing station) – Felling (the Existing station) – Gateshead Stadium (the Existing station) – Gateshead Interchange (the Existing station – the Interchange node for the Blue lane – the Initial station / the Final station of the Route: conditionally).

THE RED RING (31 stations): Pelaw (the Existing station – the Interchange node for the Violet lane – the Initial station / the Final station of the Route: conditionally) – Hebburn (the Existing station) – Jarrow (the Existing station) – Bede (the Existing station) – Simonside (the New station) – Tyne Dock (the Existing station) – Chichester (the Existing station) – South Shields (the Existing station) – Westoe (the New station) – Horsley Hill (the New station) – Marsden (the New station) – Whitburn (the New station) – Seaburn Sands (the New station) – Roker (the New station) – Stadium of Light (the Existing station – the Interchange node for the Violet lane) – Saint Peter's (the Existing station – the Interchange node for the Violet lane) – Sunderland Central (the Existing station – the Interchange node for the Violet lane) – Mowbray Road (the New station) – Percy Terrace (the New station) – Grangelown (the New station) – Ryhope (the New station) – Silksworth (the New station) – Doxford Park (the New station) – Herrington (the New station) – Thorney Close (the New station) – Pennywell (the New station) – South Hylton (the Existing station – the Interchange node for the Violet lane) – North Hylton (the New station) – Town End Farm (the New station) – Boldon Colliery (the New station) – Fellgate (the Existing station – the Interchange node for the Violet lane) – Pelaw (the Existing station – the Interchange node for the Violet lane – the Initial station / the Final station of the Route: conditionally).

Interesting patterns of Highways, Railways, Bus-routes and Metro interaction are shown in the research paper **TYNE AND WEAR CITY REGION CASE STUDY** / Draft report for comment (by A.J.Hargreaves, G.Mitchell, K.Nakamura, A.Namdeo, S.D.Wright. – June, 2009) [404, P.15; P.16; P.32]:

- HIGHWAY NETWORK STRESS POINTS AND LOCATION OF MAJOR SCHEMES FOR TREND OPTION (“A” – A1/A19 Seaton Burn Junction; “B” – A19/A189 Moor Farm Junction; “C” – A19/A1058 Silverlink Junction; “D” – A19 Tyne Tunnel; “E” – A1/A194 (M) Junction; “F” – A1/A184/A692 Junction; “G” – A1/A694/A695 Junctions). Major schemes: A1 Western Bypass Widening between A and E via G/F; A19 Junction Grade Separation between E and A via D/C/B; New Tyne Crossing at D.
- RAIL INFRASTRUCTURE IMPROVEMENTS FOR THE TREND OPTION (Ashington, Blyth and Tyne Line; Improved Durham to Cramlington Local Service; Airport Link; Leamside Link; Newcastle Bypass);
- NEW MCR ROUTES TO BE INCLUDED IN THE TREND OPTION (Existing Metro; Project Orpheus);
- NEW MCR AND SEGREGATED BUSWAY ROUTES TO BE INCLUDED IN THE COMPACTION OPTION (Existing Metro; MCR Services; BRT Segregated Busway).

REGIONAL METRO SYSTEM HAS BEEN PROPOSED IN THE SECOND HALF OF 2010 (by “Tom NUFC” – “Skyscrapercity.com” Registered User. – September 23, 2010). The Idea Author's comments: “During a period of boredom, I made this Metro extension map. As you can see it extends into Northumberland and Durham”. The Idea is the combination of developed operating lanes and new lanes: the Developed operating Yellow lane; the Developed operating Green lane; the New Red lane; the Brown lane; the New Blue lane; the New Orange lane; the New Violet lane; the New Grey lane [405].

The Developed operating YELLOW LANE (6 stations): Saint James (the Existing Developed station) – Westgate Hill (the New station) – Arthurs Hill (the New station) – Fenham

(the New station) – Benwell (the New station) – Denton Burn (the New station) – Newburn (the New station – the Interchange node for the Blue lane – the Initial station / the Final station of the Route: conditionally).

The Developed operating GREEN LANE (2 stations): South Hylton (the Existing Developed station) – Pennywell (the New station – the Initial station / the Final station of the Route: conditionally).

The New RED LANE (22 stations): Royal Quays (the New station – the Initial station / the Final station of the Route: conditionally) – Percy Main (the Existing station – the Interchange node for the Yellow lane) – Norham Road (the New station) – Silverlink (the New station) – New York (the New station) – Cobalt (the New station) – West Allotment (the New station) – Northumberland Park (the Existing station – the Interchange node for the Yellow lane) – Backworth (the New station) – Seghill (the New station) – Seaton Delaval (the New station) – New Hartley (the New station) – South Newsham (the New station) – Newsham (the New station) – Broadway (the New station) – Blyth (the New station – the Interchange node for the Orange lane) – Cowpen (the New station) – Bebside (the New station) – Bedlington Station (the New station) – Cambois (the New station) – North Seaton (the New station) – Newbiggin-by-the-Sea (the New station – the Interchange node for the Brown lane – the Initial station / the Final station of the Route: conditionally).

The New BROWN LANE (5 stations): Ashington (the New station – the Interchange node for the Blue lane – the Initial station / the Final station of the Route: conditionally) – Hirst (the New station) – Wansbeck (the New station) – Woodhorn (the New station) – Newbiggin-by-the-Sea (the New station – the Interchange node for the Red lane – the Initial station / the Final station of the Route: conditionally).

The New BLUE LANE (37 stations): Gateshead (the Existing station – the Interchange node for the Green lane and for the Yellow lane – the Initial station / the Final station of the Route: conditionally) – Bensham (the New station) – Team Valley (the New station) – Dunston (the New station) – Metrocentre (the New station – the Interchange node for the Gray lane) – Blaydon (the New station) – Stella (the New station) – Ryton (the New station) – Newburn (the New station – the Interchange node for the Yellow lane) – Lemington (the New station) – Scotswood (the New station) – Buddle Road (the New station) – Business Park (the New station) – Arena (the New station) – Central Station (the Existing station – the Interchange node for the Green lane and Yellow lane) – Manors (the Existing station – the Interchange node for the Yellow lane) – Byker (the Existing station – the Interchange node for the Yellow lane) – Chillingham Road (the Existing station – the Interchange node for the Yellow lane) – Cochrane Park (the New station) – Wiltshire Drive (the New station) – Little Benton (the New station) – Benton (the Existing station – the Interchange node for the Yellow lane) – Forest Hall (the New station) – West Moor (the New station) – Killingsworth (the New station) – Camperdown (the New station) – Dudley (the New station) – Arcot Hall (the New station) – Beaconhill (the New station) – Cramlington (the New station – the Interchange node for the Orange lane) – Nelson Village (the New station) – Hardford (the New station) – Bedlington Front Street (the New station) – Choppington (the New station) – Guide Post (the New station) – Jubilee (the New station) – Ashington (the New station – the Interchange node for the Brown lane – the Initial station / the Final station of the Route: conditionally).

The New ORANGE LANE (18 stations): Airport (the Existing station – the Interchange node for the Green lane – the Initial station / the Final station of the Route: conditionally) – Darras Hall (the New station) – Ponteland (the New station) – Prestwick (the New station) – Dinnington (the New station) – Brunswick Village (the New station) – Wideopen (the New station) – Seaton Burn (the New station) – Fisher Lane (the New station) – Beakon Lane (the New station) – Cramlington (the New station – the Interchange node for the Blue lane) – Manor Walks (the New station) – Shanklea (the New station) – Shankhouse (the New station) – Horton (the New station)

– Welfare Park (the New station) – Newsham Road (the New station) – Blyth (the New station – the Interchange node for the Red lane – the Initial station / the Final station of the Route: conditionally).

The New VIOLET LANE (31 stations): Sunderland (the Existing station – the Interchange node for the Green lane – the Initial station / the Final station of the Route: conditionally) – Hendon (the New station) – Grangetown (the New station) – Ryhope (the New station) – Seaham Grange (the New station) – Seaham (the New station) – Parkside (the New station) – Deneside (the New station) – Murton (the New station) – Hetton-le-Hole (the New station) – East Rainton (the New station) – Houghton-le-Spring (the New station) – Fencehouses (the New station) – Shiney Row (the New station) – Philadelphia (the New station) – Penshaw (the New station) – Coxgreen Road (the New station) – Fatfield (the New station) – Harraton (the New station) – Lambton (the New station) – Oxclose (the New station) – Barley Mow (the New station) – Ouston (the New station) – Beamish (the New station) – Tanfield Lea (the New station) – Marley Hill (the New station) – Whickham Fell (the New station – the Interchange node for the Grey lane) – Fellside (the New station – the Interchange node for the Grey lane) – Whickham (the New station – the Interchange node for the Grey lane) – Swalwell (the New station – the Interchange node for the Grey lane) – Metrocentre (the New station – the Interchange node for the Blue lane – the Initial station / the Final station of the Route: conditionally).

The New GREY LANE (18 stations): Metrocentre (the New station – the Interchange node for the Violet lane – the Initial station / the Final station of the Route: conditionally) – Swalwell (the New station – the Interchange node for the Violet lane) – Whickham (the New station – the Interchange node for the Violet lane) – Fellside (the New station – the Interchange node for the Violet lane) – Whickham Fell (the New station – the Interchange node for the Violet lane) – Sunnyside (the New station) – Lamesley (the New station) – Kibblesworth (the New station) – Birtley (the New station) – Crowther (the New station) – Galleries (the New station) – Washington (the New station) – Pattison Road (the New station) – Casteltown (the New station) – Wessington Way (the New station) – Southwick (the New station) – Fulwell (the New station) – Stadium of Light (the New station – the Interchange node for the Green lane – the Initial station / the Final station of the Route: conditionally).

“TYNE AND WEAR EXTENDING” (by “Newcastlemetro.blogspot.com” Registered User). The Idea of Different Existing and Extension Metro – Railway – Light Metro lanes Integration (Yellow lanes – Existing Metro, Three Red lanes, Green lane, Grey lane and Blue lane) The Idea Author’s comments: “What I would have as ‘Stage 1’ of my ‘If I ran this place’ metro extensions” [406]; “Extending the metro to Washington will” [407]; “One proposal which has been suggested to extend the metro in the future” [408]; “The last post about Washington discussed the Leamside route” [409].

GREY LANE: Newcastle Central (the Interchange node – the Hub) – Gateshead Stadium (the Metro Interchange node) – Felling (the Metro Interchange node) – Heworth (the Metro Interchange node) – Pelaw (the Metro Interchange node) – Fellgate (the Metro Interchange node) – Brockley Whins (the Metro Interchange node) – East Boldon (the Metro Interchange node) – Seaburn (the Metro Interchange node) – Stadium of Light (the Metro Interchange node) – Saint Peter’s (the Metro Interchange node) – Sunderland Central (the Interchange node – the Hub) – Mowbray Road (the Red Lane Interchange node) – Percy Terrace (the Red Lane Interchange node) – Grangetown (the Red Lane Interchange node) – Leechmere (the Red lane Interchange node) – to Seaham Rail.

FIRST RED LANE (the branch): Sunderland Central (the Interchange node – the Hub) – Mowbray Road (the Grey Lane Interchange node) – Percy Terrace (the Grey Lane Interchange node) – Grangetown (the Grey Lane Interchange node) – Leechmere (the Grey lane Interchange

node) – Ryhope – Tunsall – Mill Hill – Silksworth Lane – Gilley Law – Farrington – East Herrington.

SECOND RED LANE (the branch): Pelaw (the Existing Metro station) – Wardley – Heworth – Springwell – Parsons – Teal Farm – Pattinson.

THIRD RED LANE (the connection): South Hylton (the Existing Metro station) – Penshaw – Pattinson – Teal Farm – Barmston – Washington Village – The Galleries – Blackfell – Birtley – Chowdene (the Blue Lane Interchange node) – Low Fell (the Blue Lane Interchange node) – Saltwell (the Blue Lane Interchange node) – Bensham (the Blue Lane Interchange node) – Redheught (the Blue Lane Interchange node) – Newcastle Central (the Interchange node – the Hub) – Manors (the Metro Interchange node) – Jesmond (the Blue Lane Interchange node) – Chillingham Road (the Metro Interchange node) – Little Benton (the Blue Lane Interchange node) – East Longbenton (the Blue Lane Interchange node) – Forest Hall (the Blue Lane Interchange node) – West Moor (the Blue Lane Interchange node) – Camperdown (the Blue Lane Interchange node) – Dudley (the Blue Lane Interchange node) – South Cramlington (the Blue Lane Interchange node).

GREEN LANE: from Blaydon – Park – Metro Centre Meadow Lane – Dunston – Teams – Bensham (the Blye lane Interchange node).

BLYE LANE: – Allerdene – Chowdene (the Red Lane Interchange node) – Low Fell (the Red Lane Interchange node) – Saltwell (the Red Lane Interchange node) – Bensham (the Red Lane Interchange node) – Redheught (the Red Lane Interchange node) – Newcastle Central (the Interchange node – the Hub) – Manors (the Metro Interchange node) – Jesmond – Chillingham Road (the Metro Interchange node) – Little Benton (the Red Lane Interchange node) – East Longbenton (the Red Lane Interchange node) – Forest Hall (the Red Lane Interchange node) – West Moor (the Red Lane Interchange node) – Camperdown (the Red Lane Interchange node) – Dudley (the Red Lane Interchange node) – South Cramlington (the Red Lane Interchange node) – Cramlington – .

The basic ideas of these options (**REGIONAL RAIL NETWORK AND TYNE & WEAR METRO NETWORK**) have been developed in THE SCHEME “NEWCASTLE & SUNDERLAND” (by Andrew Smithers, 18/12/09 – “Project Mapping”) / Regional Network Maps (outside of London) [410]:

“CROSS COUNTRY” (the Brown Lane): – Durham (*the Interchange node for the Grey lane, the Dark Blue lane and the Purple lane*) – Chester-le-Street (*the Interchange node for the Grey lane and the Purple lane*) – Newcastle Central (*the Interchange node for the Metro lane, the Grey lane / Main / Loop, the Dark Blue lane, the Light Blue lane and the Purple lane – the Hub*);

“GRAND CENTRAL” (the Green Lane): Sunderland (*the Interchange node for the Metro lane, the Grey lane / Loop – the Hub*) – Hartlepool (*the Interchange node for the Gray lane / Loop*);

“NORTHERN” (the Grey Lane / Main): – Durham (*the Interchange node for the Brown lane, Dark Blue lane and Purple lane*) – Chester-le-Street (*the Interchange node for the Brown lane and Purple lane*) – Newcastle Central (*the Interchange node for the Metro lane, the Grey lane / Loop, the Brown lane, the Dark Blue lane, the Light Blue lane and the Purple lane – the Hub*) – Manors (*the Interchange node for Metro lane*) – Cramlington - ;

“NORTHERN” (the Grey Lane / Loop): – Blaydon (*the Interchange node for the Light Blue lane*) – Metro Centre (*the Interchange node for the Light Blue lane*) – Dunston (*the Interchange node for the Green lane*) – Newcastle Central (*the Interchange node for the Metro lane, the Grey lane / Main, the Brown lane, the Dark Blue lane, the Light Blue lane and the Purple lane – the Hub*) – Heworth (*the Interchange node for the Metro lane*) – Sunderland (*the Interchange node for the Green lane*) – Seaham – Hartlepool (*the Interchange node for the Green lane*) - ;

“EAST COAST” (the Dark Blue Lane): – Durham (*the Interchange node for the Grey lane, the Brown lane and the Purple lane*) – Newcastle Central (*the Interchange node for the Metro lane, the Light Blue lane, the Grey lane / Main / Loop, the Brown lane and the Purple lane – the Hub*) -;

“SCOT RAIL” (Light Blue Lane): Newcastle Central (*the Interchange node for the Metro lane, the Grey lane / Main / Loop, the Dark Blue lane, Brown lane and Purple lane – the Hub – the Initial station / the Final station of the Route: conditionally*) – Dunston (*the Interchange node for the Grey lane*) – Metro Centre (*the Interchange node for the Grey lane*) – Blaydon (*the Interchange node for the Grey lane*) - ;

“FIRST TRANSPENNINE EXPRESS” (Purple Lane): – Durham (*the Interchange node for the Grey lane, the Dark Blue lane and the Brown lane*) – Newcastle Central (*the Interchange node for the Metro lane, the Grey lane / Main / Loop, the Dark Blue lane, the Light Blue lane and the Brown lane – the Hub – the Initial station / the Final station of the Route: conditionally*);

“TYNE & WEAR METRO” (Yellow lane) connection stations: Sunderland (*the Interchange node for the Gray lane / Loop and the Green lane*); Heworth (*the Interchange node for the Gray lane / Loop*); Newcastle Central (*the Interchange node for the Gray lane / Loop / Main, the Brown lane, the Dark Blue lane, the Light Blue lane and the Purple lane*); Manors (*the Interchange node for the Gray lane / Main*).

“THE IDEA OF THE TYNE AND WEAR METRO DEVELOPMENT – 2010” (by “Newcastlemetro.blogspot.com” Registered User) – the Green Lane; the Yellow Lane; the Blue Lane; the Red Lane. The Idea Author’s comments: “Back to the Newcastle Metro! This has been a long time in the making due” [411].

THE GREEN LANE (38 stations): Ponteland (*the New station – the Initial station / the Final station of the Route: conditionally*) – Airport (*the Existing station*) – Callerton Parkway (*the Existing station*) – Bank Foot (*the Existing station*) – Kingston Park (*the Existing station*) – Fawdon (*the Existing station*) – Wansbeck Road (*the Existing station*) – Regent Centre (*the Existing station*) – South Gosforth (*the Existing station – the Interchange node for the Yellow lane*) – Ilford Road (*the Existing station – the Interchange node for the Yellow lane*) – West Jesmond (*the Existing station – the Interchange node for the Yellow lane*) – Haymarket (*the Existing station – the Interchange node for the Yellow lane*) – Monument (*the Existing station – the Interchange node for the Yellow lane*) – Newcastle Central (*the renamed Existing station – the Interchange node for the Yellow lane, the Blue lane, the Red lane – the Hub*) – Gateshead (*the Existing station – the Interchange node for the Yellow lane*) – Gateshead Stadium (*the Existing station – the Interchange node for the Yellow lane*) – Felling (*the Existing station – the Interchange node for the Yellow lane*) – Heworth (*the Existing station – the Interchange node for the Yellow lane*) – Pelaw (*the Existing station – the Interchange node for the Yellow lane*) – Fellgate (*the Existing station*) – Brockley Whins (*the Existing station*) – East Boldon (*the Existing station – the Interchange node for the Red lane*) – Seaburn (*the Existing station – the Interchange node for the Red lane*) – Stadium of Light (*the Existing station – the Interchange node for the Red lane*) – Saint Peter’s (*the Existing station – the Interchange node for the Red lane*) – Sunderland Central (*the renamed Existing station – the Interchange node for the Red lane – the Hub*) – Mowbray Road (*the New station*) – Percy Terrace (*the New station*) – Granetown (*the New station*) – Leechmere (*the New station*) – Ryhope (*the New station*) – Tunstall (*the New station*) – Mill Hill (*the New station*) – Silksworth Lane (*the New station*) – Giley Law (*the New station*) – Farrington (*the New station*) – East Herrington (*the New station – the Initial station / the Final station of the Route: conditionally*).

THE YELLOW LANE (48 stations): Lemington (*the New station – the Initial station / the Final station of the Route: conditionally*) – Denton (*the New station*) – Fenham (*the New station*) – Benwell (*the New station*) – General Hospital (*the New station*) – Science Park (*the New station*)

– Saint James (*the Existing station*) – Monument (*the Existing station – the Interchange node for the Green lane*) – Manors (*the Existing station – the Interchange node for the Blue lane*) – Byker (*the Existing station*) – Chillingham Road (*the Existing station – the Interchange node for the Blue lane*) – Walkergate (*the Existing station*) – Wallsend (*the Existing station*) – Hadrian Road (*the Existing station*) – Howdon (*the Existing station*) – Percy Main (*the Existing station*) – Meadow Well (*the Existing station*) – North Shields (*the Existing station*) – Tynemouth (*the Existing station*) – Cullercoats (*the Existing station*) – Whitley Bay (*the Existing station*) – Monkseaton (*the Existing station*) – West Monkseaton (*the Existing station*) – Shiremoor (*the Existing station*) – Northumberland Park (*the Existing station*) – Palmersville (*the Existing station*) – Benton (*the Existing station*) – Four Lane Ends (*the Existing station*) – Long Benton (*the Existing station*) – South Gosforth (*the Existing station – the Interchange node for the Green lane*) – Ilford Road (*the Existing station – the Interchange node for the Green lane*) – West Jesmond (*the Existing station – the Interchange node for the Green lane*) – Haymarket (*the Existing station – the Interchange node for the Green lane*) – Monument (*the Existing station – the Interchange node for the Green lane*) – Newcastle Central (*the renamed Existing station – the Interchange node for the Green lane, the Blue lane, the Red lane – the Hub*) – Gateshead (*the Existing station – the Interchange node for the Green lane*) – Gateshead Stadium (*the Existing station – the Interchange node for the Green lane*) – Felling (*the Existing station – the Interchange node for the Green lane*) – Heworth (*the Existing station – the Interchange node for the Green lane*) – Pelaw (*the Existing station – the Interchange node for the Green lane*) – Hebburn (*the Existing station*) – Jarrow (*the Existing station*) – Bede (*the Existing station*) – Simonside (*the Existing station*) – Tyne Dock (*the Existing station – the Interchange node for the Red lane*) – Chichester (*the Existing station – the Interchange node for the Red lane*) – South Shields (*the Existing station – the Interchange node for the Red lane – the Initial station / the Final station of the Route: conditionally*).

THE BLUE LANE (21 stations): Ryton (*the New station – the Initial station / the Final station of the Route: conditionally*) – Blaydon (*the New station*) – Riverside Park (*the New station*) – Metro Centre (*the New station*) – Meadow Lane (*the New station*) – Dunston (*the New station*) – Teams (*the New station*) – Bensham (*the New station – the Interchange node for the Red lane*) – Redheugh (*the New station – the Interchange node for the Red lane*) – Newcastle Central (*the renamed Existing station – the Interchange node for the Green lane, the Yellow lane, the Red lane – the Hub*) – Manors (*the Existing station – the Interchange node for the Yellow lane*) – Jesmond Vale (*the New station*) – Chillingham Road (*the Existing station – the Interchange node for the Yellow lane*) – Benfield (*the New station*) – Little Benton (*the New station*) – East Longbenton (*the New station*) – Forest Hall (*the New station*) – West Moor (*the New station*) – Camperdown (*the New station*) – Dudley (*the New station*) – Cramlington (*the New station – the Initial station / the Final station of the Route: conditionally*).

THE RED LANE (29 stations): Newcastle Central (*the renamed Existing station – the Interchange node for the Green lane, the Yellow lane, the Blue lane – the Hub – the Initial station / the Final station of the Route: conditionally*) – Redheugh (*the New station – the Interchange node for the Blue lane*) – Bensham (*the New station – the Interchange node for the Blue lane*) – Saltwell (*the New station*) – Low Fell (*the New station*) – Chowdene (*the New station*) – Allerdene (*the New station*) – Birtley (*the New station*) – Blackfell (*the New station*) – The Galleries (*the New station*) – Washington Village (*the New station*) – Barmston (*the New station*) – Teal Fearn (*the New station*) – Pattinson (*the New station*) – Penshaw (*the New station*) – South Hylton (*the Existing station*) – Pallion (*the Existing station*) – Millfield (*the Existing station*) – University (*the Existing station*) – Park Lane (*the Existing station*) – Sunderland Central (*the renamed Existing station – the Interchange node for the Green lane – the Hub*) – Saint Peter's (*the Existing station – the Interchange node for the Green lane*) – Stadium of Light (*the Existing station – the Interchange node for the Green lane*) – Seaburn (*the Existing station – the Interchange node for the Green lane*) – East Boldon (*the Existing station – the Interchange node for the Red lane*) –

Biddick Hall (*the New station*) – Tyne Dock (*the Existing station – the Interchange node for the Yellow lane*) – Chichester (*the Existing station – the Interchange node for the Yellow lane*) – South Shields (*the Existing station – the Interchange node for the Yellow lane – the Initial station / the Final station of the Route: conditionally*).

“And here are some minor changes to the more traditional metro map” [412]:

THE GREEN LANE (38 stations).

THE YELLOW LANE (49 stations): Lemington (*the New station – the Initial station / the Final station of the Route: conditionally*) – Scotswood (*the New station*) – Denton (*the New station*) – Slatyford (*the New station*) – Benwell (*the New station*) – General Hospital (*the New station*) – Science Park (*the New station*) – Saint James (*the Existing station*) – Monument (*the Existing station – the Interchange node for the Green lane*) – Manors (*the Existing station – the Interchange node for the Blue lane*) – Byker (*the Existing station*) – Chillingham Road (*the Existing station – the Interchange node for the Blue lane*) – Walkergate (*the Existing station*) – Wallsend (*the Existing station*) – Hadrian Road (*the Existing station*) – Howdon (*the Existing station*) – Percy Main (*the Existing station*) – Meadow Well (*the Existing station*) – North Shields (*the Existing station*) – Tynemouth (*the Existing station*) – Cullercoats (*the Existing station*) – Whitley Bay (*the Existing station*) – Monkseaton (*the Existing station*) – West Monkseaton (*the Existing station*) – Shiremoor (*the Existing station*) – Northumberland Park (*the Existing station*) – Palmersville (*the Existing station*) – Benton (*the Existing station – the Interchange node for the Blue lane*) – Four Lane Ends (*the Existing station*) – Long Benton (*the Existing station*) – South Gosforth (*the Existing station – the Interchange node for the Green lane*) – Ilford Road (*the Existing station – the Interchange node for the Green lane*) – West Jesmond (*the Existing station – the Interchange node for the Green lane*) – Haymarket (*the Existing station – the Interchange node for the Green lane*) – Monument (*the Existing station – the Interchange node for the Green lane*) – Newcastle Central (*the renamed Existing station – the Interchange node for the Green lane, the Blue lane, the Red lane – the Hub*) – Gateshead (*the Existing station – the Interchange node for the Green lane*) – Gateshead Stadium (*the Existing station – the Interchange node for the Green lane*) – Felling (*the Existing station – the Interchange node for the Green lane*) – Heworth (*the Existing station – the Interchange node for the Green lane*) – Pelaw (*the Existing station – the Interchange node for the Green lane*) – Hebburn (*the Existing station*) – Jarrow (*the Existing station*) – Bede (*the Existing station*) – Simonside (*the Existing station*) – Tyne Dock (*the Existing station – the Interchange node for the Red lane*) – Chichester (*the Existing station – the Interchange node for the Red lane*) – South Shields (*the Existing station – the Interchange node for the Red lane – the Initial station / the Final station of the Route: conditionally*).

THE BLUE LANE (22 stations): Ryton (*the New station – the Initial station / the Final station of the Route: conditionally*) – Blaydon (*the New station*) – Riverside Park (*the New station*) – Metro Centre (*the New station*) – Meadow Lane (*the New station*) – Dunston (*the New station*) – Teams (*the New station*) – Bensham (*the New station – the Interchange node for the Red lane*) – Redheugh (*the New station – the Interchange node for the Red lane*) – Newcastle Central (*the renamed Existing station – the Interchange node for the Green lane, the Yellow lane, the Red lane – the Hub*) – Manors (*the Existing station – the Interchange node for the Yellow lane*) – Byker (*the Existing station – the Interchange node for the Yellow lane*) – Chillingham Road (*the Existing station – the Interchange node for the Yellow lane*) – Benfield (*the New station*) – Little Benton (*the New station*) – Benton (*the Existing station – the Interchange node for the Blue lane*) – Forest Hall (*the New station*) – West Moor (*the New station*) – Camperdown (*the New station*) – Dudley (*the New station*) – South Cramlington (*the New station*) – Cramlington (*the New station – the Initial station / the Final station of the Route: conditionally*).

THE RED LANE (29 stations).

Railway junctions in the Region included in the overall **SCHEME OF DEVELOPMENT OF THE RAILWAYS OF THE UNITED KINGDOM**:

- "GREAT BRITAIN NATIONAL RAIL NETWORK DIAGRAM – FEBRUARY 2011" (by Andrew Smithers, 28/1/11 – "Project Mapping") [413];
- "GREAT BRITAIN NATIONAL RAIL TRAIN OPERATORS – MAY 2011" (by Andrew Smithers, 24/4/11 – "Project Mapping") [414].

Correspondingly increases the value of the NEWCASTLE and SUNDERLAND Metro stations.

In mid-2011 published **"THE TYNE AND WEAR METRO DEVELOPMENT PROPOSAL – 2011"** (by Gleb K.Samoilov, July 2011). THE NORTHUMBERLAND – TYNE and WEAR – DURHAM METRO as the result of the Tyne & Wear Metro Development (The First published – July, 28th, 2011) [415; 416; 417; 418; 419; 420].

The Ring line: "SEABURN – PORT – SOUTH CRAMLINGTON – AIRPORT – RYTON – NEWBOTTLE – PARK LANE".

The Diametric line: "BLYTH – SOUTH CRAMLINGTON – PELAW – NEWBOTTLE – PETERLEE".

Radial lines: "SAINT JAMES – THROCKLEY – HEDDON-ON-THE-WALL"; "EAST DURHAM – CHESTER-LE-STREET – LOW FELL (branch on LEAM LANE) – GATESHEAD"; "SOUTH HYLTON – GLEBE – BIRTLEY (branch on FATFIELD) – KIBBLESWORTH – THE METRO CENTRE – RYTON – PRUDHOE"; "CONSETT – STANLEY – WHICKHAM – CENTRAL STATION – MANORS (branch on THE METRO CENTRE – BENSHAM – FELLING)".

Branches of radial lines: "AIRPORT – PONTELAND"; "BANK FOOT – HAYMARKET"; "HOWDON – PORT"; "SOUTH SHIELDS – TYNEMOUTH"; "REGENT CENTRE – LONGBENTON".

The Diagram is shown in the Figure 1. Proposal Details is considered in Chapters 3, 4 and 5 of this Study.

The current system of the Tyne and Wear Metro included in project proposals for the Development of the Country's railways: **"GREAT BRITAIN NATIONAL RAIL TRAIN OPERATORS – OCTOBER 2011"** (by Andrew Smithers, 3/10/11– "Project Mapping") [421].

At this point (January 2012) one of the last of the published proposals are – **Metro System Tyne & Wear: Drawn on the Idea of the Orpheus scheme** (by "Rational Plane" – "Skyscrapercity.com" Registered User. – October 4, 2011) [422].

The Idea Author's comments: "Where ever possible I have reused old rail trackbeds or extended s services over existing railways. Routes near the East coast main, are either parallel on greenfield land, or where there is no space on a viaduct. As these new routes would be run by express trams, where required short sections of street running would occur. Less than 5% of the route length used has street running. This to avoid traffic, but mostly the cost of utility relocation. These routes on my map are colored Purple. The new routes are: Ashington and Blyth, Coast Road – Battle Hill – Silverlink – North Tyneside Hospital – Whitley Bay, Consett – Rowlands Gill – Metrocentre, Team Valley – Birtley and Washington, South Hylton – Penshaw – Washington, Doxford and Seaham. The lines to Consett, Ashington and Blyth would only have four trams an hour off peak. There would also be a direct route between Washington and the Metrocentre. In addition there are some more expensive but short tunneled routes. One route from Newcastle General to Lemmington and one to Lowfell and Harlow Green. If all the lines South of river are developed then that leaves us with a congestion problem through Gateshead and Newcastle, here I have developed an express route from East of Pelaw under the Tyne along the old rail alignment to Byker and into Town, this would miss out quite a few stations and provide a quicker journey".

The map illustrates the Tyne and Wear Metro Development Proposal, showing the existing rail network and proposed new lines. The map covers Northumberland, Durham, and the North Sea. The existing rail network is shown in black, while the proposed new lines are shown in red (New Ring lane) and blue (New Radial lanes). The map includes numerous station names and geographical features, such as the North Sea, Tyne, and Wear rivers. The map is titled 'NORTHUMBERLAND' at the top, 'DURHAM' at the bottom, and 'NORTH SEA' on the right. The map also includes a legend at the bottom right, indicating 'Existing lane', 'New Ring lane', and 'New Radial lanes'.

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011):
the First publication 07/28/2011 - <http://www.skyscrapercity.com/showthread.php?p=82175232>

All these proposals show features of the Tyne & Wear Metro assessment of the prospects of development in different years, from the earliest stages of design and construction. Some of these proposals are implemented. Consideration of cumulative projects is an integral part of the history of the Tyne & Wear Metro and all Public Transport of United Kingdom.

Conclusions of the Second chapter

Held in the Second chapter analysis led to the following conclusions:

1. During the second half of the twentieth century in the Conurbation for passenger transport used several forms of public transport: Trams, Trolley buses, Buses, Taxis, Metro and Suburban Railroads.
2. During the second half of the twentieth century in the Conurbation changed several times the concept of passenger traffic. Priority public transport were successively: Suburban Railways, Trolleys, Metro and Buses.
3. Changing priorities in the development of public transport has led to a reduction, and in some cases and to eliminate certain types of public transport.
4. Currently there are no fully Tram and Trolleybus.
5. In the suburban rail decommissioned a few lines. Some of these lines is used since the early 1980s, Metro, some not in use, part dismantled. On the existing commuter rail lines closed some stations. Most of the stations are part of the exploited Regional and Trans-regional railway lines.
6. Adopted the concept of implied pre-emptive use of Metro decommissioned Suburban Railway lines. Part of the sites in the central parts of Newcastle, Gateshead and Sunderland done underground. This new construction sites. The section from Sunderland to Heworth in joint operation with the Railroads.
7. The gradual development of the Metro implies a gradual transformation into a dominant form of public transport. The Metro was to be the basis of the Conurbation Integrated public transport.
8. At the present stage, the Priority of the Conurbation Public transport is the Buses.
9. The presence of monocentric organization Bus system, which target the major railway junctions, leads to a high concentration of routes in the central parts of cities (for example, Newcastle Central / Haymarket Bus Station - 37 routes; Durham Bus Station - 21 routes; Gateshead - 51 routes, Sunderland Interchange - 44 routes, Metrocentre Interchange - 31 routes).
10. Most Tyne and Wear Metro stations linked with only 1 or 2 bus routes (for example, South Gosforth, Palmersville, Northumberland Park, Shiremoor, West Monkseaton, Monkseaton, Cullercoats, Tynemouth, North Shields).
11. Some routes overlap with Tyne and Wear Metro line. The large number of "Long" routes.
12. The difference in the number of stops the bus and conventional bus speed is 20%. Often there are same numbers of different routes.
13. During the second half of the Twentieth century and the beginning of Twenty first century individuals and corporations developed many concepts of Conurbation public transport. Concept developed by: Order of the Government, ordering Local governments, private initiative. Proposals and projects had varying degrees of granularity: from individual circuits and drawings to full projects.

14. Suggestions ranged from the development of certain types of public transport and the creation of large integrated systems, which include two, three, four types of Public transport.
15. Part of the proposals has lost its urgency with the development of the Conurbation Public transport.
16. Some of the proposed ideas were used in the development of certain types of Public transport and the Integration.
17. Part of the proposed ideas remains relevant in connection with the necessity of further development of the Conurbation Public transport.
18. New Proposals for the development of the Public transport continue to be developed.

The Chapter 3

THE DEVELOPMENT OF THE TYNE AND WEAR CONURBATION METRO

3.1 The Determination of the Optimal Metro scheme

The issue of comfortable public transport links Tyne and Wear Conurbation with each passing year becomes more and more complicated. It needs to be addressed.

The distribution of passengers in various types of public transport is shown in a special Research Agenda "State of the Region / Transport" (by NORTH EAST Research & Information Partnership, 2010): "Travel to work in the North East in 2009 is dominated by the car, with almost three quarters (74%) of commutes in the North East done by private transport, 4% higher than the national average. In the urban centre of Tyne and Wear, there is a greater tendency to use public transport and the results are much more in line with the national average. Particularly, in Tyne and Wear and 13% of workers use the bus to commute to work, compared with 7% nationally. While rail use is much less than the national average, Tyne and Wear compares with the national average with regard to "Other Rail", reflecting the existence of the Metro system" [3].

Metro is the main mode of public transport of Tyne and Wear Conurbation. During last 5 years there was steady growth of passenger traffic volume. Tyne and Wear Metro Passenger ride – 47 million (2008) – is on 97th place of 132 in the World; on 34th place of 43 in the Western and Central Europe; on 3rd place of 4 in the United Kingdom [423]. According to other sources – "Tyne & Wear Metro Journeys Trends" [3] – passenger traffic is 41-42 million per year.

The Metro – is the most convenient form of public transport. There is objective need for the existing Tyne and Wear Metro network expansion.

The world practice of Metro systems operation shows that convenient for passengers distance to Metro station – 1.00 km / 0.62 miles. This corresponds to: 15 minutes of Walking; 5 minutes on the Scooter; 4 minutes on the Bicycle; 3 minutes on the Bike; 2 stops by Bus. However, the existing network of Tyne and Wear Metro does not cover all potential passengers (The Figure 2).

Firstly, more than 300 thousand inhabitants of certain areas of Tyne and Wear County (Newcastle upon Tyne, Castle Ward, Longbenton, Gateshead, Sunderland – partly, New Byrn, Ryton, Blaydon, Whickham, Chester-le-Street, Washington, Houghton-le-Spring, Easington, Hetton – completely) denied from easy access to Metro.

Secondly, about 280 000 of integrated to public transport system Tyne and Wear (working, studying, shopping, recreation, airport, port, railway stations) residents of Northumberland and Durham (Seaham, Peterlee, Durham, Chester-le-Street, Consett, Stanley, Prudhoe, Ponteland, Cramlington, Blyth) are deprived of a convenient connection to the Metro.

Thirdly, some large residential and industrial areas, shopping centers and places of public entertainment do not have easy and fast connection between them. Providing this connection will increase the quantity of trips.

In addition, in the existing network have a number of problems in the area of operation and environmental protection. Ramiform solution of the lines and one metro bridge across the River Tyne can not provide a stable work of the system during the repair and maintenance works on some parts of routes and stations. The current practice of these works on weekends and holidays is limiting the Metro network. At the same time, on weekends and holidays the number of

visits to places of personal and public recreation, visiting shopping centers and entertainment significantly increases. Surface location of most sites complicates the solution of environmental issues (noise, electromagnetic radiation of the line).

The existing built-up of Tyne and Wear Conurbation the provision of additional territory for new metro routes impractical. Now occupied by terrestrial lanes 4.5 square kilometers of the most valuable territory in the densely built-up areas. Further development of land lines would require a further 10 – 12 square kilometers of territory. It will be necessary to demolish the houses and public buildings in the band width of 50 meters along the route. The cost of demolition of structures and compensation many times exceed the cost of underground lanes. Will be very great damage to the Cultural, Historical and Moral spheres. From the standpoint of saving money to do all the lines underground.

Underground installation of new lines is expensive. During the construction of existing lines in the centers of Newcastle, Gateshead and Sunderland were made as tunnels. Then, in early development, partial laying of lines as underground solved the operational problem.

Now the situation with the availability of the Public transport in the Conurbation became much more complex. In the new phase of development, I think that the entire network of Tyne and Wear Metro must be underground. First, the new lines, and then, gradually, all now existing ones. It's expensive, but other attempts to solve the problem are even more expensive. In addition, the lines laid underground allow making stations in those places where they are needed most to residents.

The existing network of Tyne and Wear Metro distance between the stations is too short. This technology is not convenient for the train. This is inconvenient for passengers.

Bridges are a very important aspect. Now the only metro bridge makes it impossible to carry out repairs without disrupting the right bank and left bank of the Tyne River.

And, most importantly, accessibility greatly affects the value of land sides and their attractiveness to investors. A significant part of Conurbation (as shown by several studies, such as "Transport accessibility and land value: a case study of Tyne and Wear" / RICS, Newcastle University. – 2007 [424]) has a low transport accessibility and, therefore, the low cost of land sides.

In this situation, it is expedient to intensive development of the Metro. It will be the basis of all types of Internal and External Public Transport Integration.

Geographical features of the location of key elements of the external and internal public transportation, residential districts and working areas, places of mass recreation and entertainment, shopping and educational facilities, stadiums and health-sports centers, historical sites and precious natural landscapes of the Tyne and Wear Conurbation determine the acceptable type of Metro scheme.

In international practice for similar situations with the polycentric location of objects successfully applied Complex Loop-shaped schemes and Ring-Radial schemes.

Complex Loop-shaped and Ring-Radial schemes are often used in the international practice of metro building. In most cases the Metro – it's a combination of ground and underground lines. Ground and underground lines have different lengths.

For example, such work successfully Metros.

Metros with Complex Loop-shaped schemes:

- The LONDON's Metro ("The Tube" or "The Underground") has a length of 402 km, the number of lines – 11 and the number of stations – 270 [425].
- The NEW-YORK's Metro ("New York City Subway") has a length of 337 km, the number of lines – 24 and the number of stations – 468 [426].
- The MELBOURNE's Metro ("Metro Trains Melbourne") has a length of 830 km, the number of lines – 17 and the number of stations – 211. Feature of the Melbourne

Metro is that, depending on time of day on the Ring line trains go clockwise or counterclockwise [427].

- The HAMBURG's Metro ("Hamburg U-Bahn") has a length of 100 km, the number of lines – 3 and the number of stations – 89 [428].
- The CHICAGO's Metro (Chicago's "L") has a length of 182,5 km, the number of lines – 8 and the number of stations – 144 [429].
- The MIAMI's Metro ("Miami Metrorail") has a length of 36,0 km, the number of lines – 2 and the number of stations – 22 [430].
- The TOKYO's Metro ("Tokyo Metro") has a length of 305 km, the number of lines – 13 and the number of stations – 290 [431].
- The ALICANTE's Metro ("TRAM Metropolità d'Alacant") has the number of lines – 9 and the number of stations – 128 [432].
- The DOURTMUND's Metro ("U-Stadtbahn") has a length of 29,5 km, the number of lines – 8 and the number of stations – 83 [433].
- The BRUSSELS's Metro ("Brusselse metro") has a length of 49,9 km, the number of lines – 7 and the number of stations – 68 [434].
- The OSLO's Metro ("Oslo T-bane" or "Oslo Tunnelbane") has a length of 84,2 km, the number of lines – 6 and the number of stations – 94 [435].
- The CHARLEROI's Metro ("Metro Leger de Charleroi") has a length of 25 km, the number of lines – 4 and the number of stations – 25 [436].

Metros with Ring-Radial schemes:

- The MADRID's Metro ("Metro de Madrid") has a length of 310 km, the number of lines – 16 and the number of stations – 320. The Madrid Metro is the only one in the world, which has two circular lines [437].
- The MOSCOW's Metro ("Moskowskii Metropoliten") has a length of 301 km, the number of lines – 12 and the number of stations – 182 [438].
- The BERLIN's Metro ("U-Bahn Berlin") has a length of 152 km, the number of lines – 9 and the number of stations – 173 [439].
- The SHANGHAI's Metro ("Shanghai Ditie") has a length of 412 km, the number of lines – 12 and the number of stations – 273 [440].
- The BEIJING's Metro ("Beijing Ditie") has a length of 336 km, the number of lines – 14 and the number of stations – 172 [441].
- The SEOUL's Metro ("Seoul Metropolitan Subway") has a length of 314 km (with commuter lines – 755 km), the number of lines – 14 and the number of stations – 436 [442].
- The SHENYANG's Metro ("Shenyang Metro") now has a length of 27,8 km, the number of lines – 1 and the number of stations – 22. Development Plan: 5 lines with the Ring line – the total length of 182,5 km [443].
- The NAGOYA's Metro ("Nagoya Shiei Chikatetsu") has a length of 151,9 km, the number of lines – 7 and the number of stations – 83 [444].
- The NAPOLI's Metro ("Metropolitana di Napoli") has a length of 91,5 km, the number of lines – 8 and the number of stations – 83 [445].
- The DAEJEON's Metro ("Daejeon Metropolitan Subway") has a length of 22,6 km, the number of lines – 1 and the number of stations – 22. At the Daejeon Metro in addition to a single Radial line ("Banseok – Panam") is constructed Ring line (through stations: YuseongSpa, Seodaejeonnegeori, Dae-dong) [446].
- The DUBLIN's Metro ("Meitreo Átha Cliath") now has a length of 42,0 km, the number of lines – 2 and the number of stations – 34. The original decision on the Metro development set out in the Plan "Transportation 21": 2010 – Metro West Phase 1 (Tallaght to Clondalkin); 2011 – Metro West Phase 2 (Clondalkin to Lucan); 2012 –

Metro West Phase 3 (Lucan to Blanchardstown); 2013 – Metro North; 2014 – Metro West Phase 4 (Blanchardstown to Ballymun) [447].

- The GLASGOW's Metro ("Glasgow Subway") is the most precise Ring-Radial scheme. It has an Underground Ring line length of 10,4 km. In this line placed 15 stations. Underground Ring line is integrated with the ground Radial lines of Suburban Rail. Interchange nodes are three stations: "Patrick", "Buchanan Street" and "Saint Enoch" [448].

In World practice metros with ring-radial scheme the train with passengers runs only on one line. There are technological maneuver trains from one line to another without passengers. The movement of the train with passengers from the line to line is possible in principle, but its practical application – is a rare phenomenon. The motion of the train with passengers on the entire Metro network does not apply. The partial overlapping of individual radial routes and the ring route is used in the Melbourne metro.

In contrast to these examples, the proposed scheme of Tyne and Wear Metro allows to combine Rings and Radial lines (Figures 3 and 4).

New lines Basis of the configuration are following principles:

- the location of the stations on the straights (predominantly);
- the minimum radius of curves – 600 meters.

The developed network of the Metro has four overlapping rings, and eight radial branches, that connect to rings and each other in the central part:

- THE RING LANE: *Airport, South Cramlington, West Monkseaton, Meadow Well, Port, Chichester, Seaburn – Park Lane, New Silksworth, Newbottle, Chester-le-Street, Stanley, Ryton, Throckley, Airport*;
- DIAMETRAL AND RADIAL LANES: Blyth, South Cramlington, Four Lane Ends, Walkergate, Pelaw, Leam Lane, Glebe, Fatfield, Newbottle, Peterlee*; *Heddon-on-the-Wall, Throckley, Saint James*; *Prudhoe, Ryton, The Metro Centre, Bensham, Mount Pleasant, Felling*; *Consett, Stanley, Whicham, Bensham, Central Station / Newcastle Railway station*; *South Hylton, Glebe, Birtley, Kibblesworth, Wickham, The Metro Centre*; *East Durham, Chester-le-Street, Kibblesworth, Low Fell, Mount Pleasant, Gateshead*; *Tyne Dock, Brockle Whins, Pallion, New Silksworth, Seaham*; *Birtley, Fatfield*; *Low Fell, Leam Lane*, *Airport, Ponteland*, *Bank Foot, Kenton, Haymarket*; *Ragene Centre, Longbenton*; *Central Station / Newcastle Railway station, Manors*; *Howdon, Port*; *South Shields, Best View, Tynemouth*.

This allows for the delivery of passengers from any station to any without stopping. Movement of trains is carried out in one direction. An exception is the line that connects the Blyth, Cramlington, South Cramlington, Killingworth, Four Lane Ends, Walkergate, Walker, Pelaw. To move from this area on the integrated network you must change the direction of the train. This change is made on the detour section or deadlock section after stations Pelaw or Leam Lane.

In proposed extensive Metro scheme the interchanges of two kinds are applied – "Parallel" and "Perpendicular". All the new stations have "Island" platform type. Reconstructed stations have platforms of "Island" type and "Coastal" type.

"Perpendicular" interchange node provides the passenger transition from station to station in three versions: "Side-Side", "Middle-Side" or "Side-Middle", "Middle-Middle". Interchange node of this type organized on 10 new stations (South Cramlington, New Silksworth, Newbottle, Chester-le-Street, Stanley, Ryton, Throckley, Glebe, Kibblesworth, Mount Pleasant) and on 7 reconstructed (Airport, West Monkseaton, Meadow Well, Chichester, Four Lane Ends, Walkergate, Pallion).

At the "Monument" station the interchange node of "Perpendicular" type remains

The map illustrates the Tyne and Wear Metro Development Proposal, showing the existing network and proposed new lines. The map is color-coded to distinguish between different types of lanes:

- Existing lane:** Black line
- New Ring lane:** Red line
- New Radial lanes:** Blue line

The map shows the Tyne and Wear Metro network, including the existing network and the proposed new lines. The map is divided into three main regions: Northumberland (yellow), North Sea (blue), and Durham (dark grey). The map shows the Tyne and Wear Metro network, including the existing network and the proposed new lines. The map is divided into three main regions: Northumberland (yellow), North Sea (blue), and Durham (dark grey). The map shows the Tyne and Wear Metro network, including the existing network and the proposed new lines.

Northumberland

North Sea

Durham

Tyne and Wear Metro Development Proposal
by Gleb K. Samoilov July 2011

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

unchanged.

“Parallel” interchange node provides the transfer on the station in two ways: “On the same platform” with the transfer of passengers in the forward direction, or “Over the platform” for transfer of passengers in the opposite direction. Interchange node of this type organized on 8 new stations (Port, The Metro Centre, Bensham, Whickham, Low Fell, Birtley, Fatfield, Leam Lane) and on 15 reconstructed (Bank Foot, Haymarket, Regent Centre, Longbenton, Manors, Central Station, Howdon, Tynemouth, South Gosforth, Tyne Dock, Brockley Whins, Felling, Gateshead, Seaburn, Park Lane).

At the “Pelaw” station there is the Combination interchange node: “Parallel” / “Perpendicular”.

To ensure reliable operation of underground lines between stations located Detour sections and Deadlock sections.

The length of detour sections allows overtaking, parking and change of direction. In the Scheme three types of detour are used.

- Detour-1: the detour to the left of main tracks, the detour between of main tracks, the detour to the right of main tracks. The Detour-1 provides the ability to maneuver for five trains.
- Detour-2: the detour to the left of main tracks or the detour to the right of main tracks, the detour between of main tracks. The Detour-2 provides the ability to maneuver for four trains.
- Detour-3: the detour between of main tracks. The Detour-3 provides the ability to maneuver for three trains.

The length of deadlock sections allows parking and change of direction. Used three types of deadlock.

- Deadlock-1: the deadlock to the left of main tracks, the deadlock between of main tracks, the deadlock to the right of main tracks, ends of main tracks. The Deadlock-1 provides the ability to maneuver for five trains.
- Deadlock-2: the deadlock to the left of main tracks or the deadlock to the right of main tracks, the deadlock between of main tracks, ends of main tracks. The Deadlock-2 provides the ability to maneuver for four trains.
- Deadlock-3: the deadlock between main tracks ends of main tracks. The Deadlock-3 provides the ability to maneuver for three trains.

All new stations lobbies for inputs and outputs from streets (antechambers or anterooms) are located below ground. An exception is the station “Best View”, which located on the New Bridge.

In the proposed system, Tyne and Wear Metro all new lines are underground. In the future, it is necessary to make the existing lines also underground. The proposed scheme has three tunnels under the River Tyne and the New Bridge.

3.2 The Formation of the Ring-Radial Metro scheme

Implementation of the Project is appropriate to maintain consistently in several stages. The Basic Version – Eight Stages of Development.

The First Stage of Development.

The Ring line: “SEABURN – PORT – SOUTH CRAMLINGTON – AIRPORT – RYTON – NEWBOTTLE – PARK LANE”.

The distances between stations: Seaburn (the Rebuild operating station – the Interchange node) – *1,275 km / 0,79 miles* – Cleadon (the New station) – *1,445 km / 0,90 miles* – Harton (the New station) – *0,985 km / 0,61 miles* – Chichester (the Rebuild operating

station – the Interchange node) – *0,915 km / 0,57 miles* – Port (the New station – the Interchange node) – *0,550 km / 0,34 miles* – Meadow Well (the Rebuild operating station – the Interchange node) – *1,000 km / 0,62 miles* – Billy Mill (the New station) – *1,330 km / 0,83 miles* – West Monkseaton (the Rebuild operating station – the Interchange node) – *2,460 km / 1,53 miles* – Seaton Delaval (the New station) – *1,980 km / 1,23 miles* – South Cramlington (the New station – the Interchange node) – *2,135 km / 1,33 miles* – Wideopen (the New station) – *1,680 km / 1,04 miles* – Dinnington (the New station) – *1,710 km / 1,06 miles* – Airport (the Rebuild operating station – the Interchange node) – *2,700 km / 1,68 miles* – Throckley (the New station – the Interchange node) – *1,275 km / 0,79 miles* – Ryton (the New station – the Interchange node) – *3,040 km / 1,89 miles* – Rowlands Gill (the New station) – *1,470 km / 0,91 miles* – Burnopfield (the New station) – *2,570 km / 1,060 miles* – Stanley (the New station – the Interchange node) – *3,560 km / 2,21 miles* – Chester-le-Street (the New station – the Interchange node) – *3,425 km / 2,13 miles* – Newbottle (the New station – the Interchange node) – *2,870 km / 1,78 miles* – New Silksworth (the New station – the Interchange node) – *1,085 km / 0,67 miles* – Hillview (the New station) – *0,765 km / 0,48 miles* – Park Lane (the Rebuild operating station – the Interchange node).

The location of detour sections and deadlock sections: Seaburn – (Deadlock-3) Cleadon (Deadlock-3) – (Deadlock-3) Harton – (Detour-1) – Chichester – Port – Meadow Well (Deadlock-3) – (Deadlock-3) Billy Mill (Deadlock-3) – (Deadlock-3) West Monkseaton (Deadlock-3) – (Deadlock-3) Seaton Delaval (Deadlock-3) – (Deadlock-3) South Cramlington (Deadlock-3) – (Deadlock-3) Wideopen – (Detour-1) – Dinnington – (Deadlock-3) Airport (Deadlock-3) – (Deadlock-3) Throckley – Ryton (Deadlock-3) – (Deadlock-3) Rowlands Gill – (Detour-1) – Burnopfield (Deadlock-3) – (Deadlock-3) Stanley (Deadlock-3) – (Deadlock-3) Chester-le-Street (Deadlock-3) – (Deadlock-3) Newbottle (Deadlock-3) – (Deadlock-3) New Silksworth (Deadlock-2) – (Deadlock-2) Hillview – Park Lane.

Placements of inputs and outputs from streets to underground antechambers of new stations: Cleadon (*on the Whitburn Road, between the Laburnum Grove and the Meadowfield Drive*), Harton (*on the Saint Mary's Avenue, between the Hight Road and the Fairholme Avenue*), Port (*on the Hayhole Road, near the Royal Quays Outlet Shopping*), Billy Mill (*on the Coast Road, between the Prestwick Avenue and the Cornhill Crescent*), Seaton Delaval (*on the Elsdon Avenue, between the Whitfield Road and the Ridds Dalec*), South Cramlington (*on the Greenlaw Road, near the Winster Place*), Wideopen (*on the Stalks Road, between the Blanchland Avenue and the A1 High Way*), Dinnington (*on the Site, between the North View and the Front Street*), Throckley (*on the Newburn Road, between the Hexham Road and the Post Office*), Ryton (*on the Main Road, between the Tower Gardens and the Dene Crescent*), Rowlands Gill (*on the Hookergate Lane, between the Hightfield Road and the Woodlea Road*), Burnopfield (*on the Syke Road, near the Brich Crescent*), Stanley (*on the Humber Hill, near the Brooks Close*), Chester-le-Street (*on the South Approach, near the Hall*), Newbottle (*on the Coaley Lane, between the Beechwood Terrace and the Staddon Way*), New Silksworth (*on the Tunstall Village Road, near the Fair Ways*), Hillview (*on the B1405 High Way, near the Playing Fields*).

Basic data on the line of the First Stage of Development.

The length of the line – 40,230 km / 24,99 miles.

The number of stations – 23:

- new stations – 17 (Cleadon, Harton, Port, Billy Mill, Seaton Delaval, South Cramlington, Wideopen, Dinnington, Throckley, Ryton, Rowlands Gill, Burnopfield, Stanley, Chester-le-Street, Newbottle, New Silksworth, Hillview);
- rebuild operating stations – 6 (Seaburn, Chichester, Meadow Well, West Monkseaton, Airport, Park Lane);
- expand operating stations – 0.

The number of interchange nodes – 14:

- at new stations – 8 (Port, South Cramlington, Throckley, Ryton, Stanley, Chester-le-Street, Newbottle, New Silksworth);
- at operating stations – 6 (Seaburn, Chichester, Meadow Well, West Monkseaton, Airport, Park Lane).

The average distance between stations – 1,89 km / 1,14 miles.

The maximum distance between stations – 3,560 km / 2,21 miles (Chester-le-Street – Stanley).

The minimum distance between stations – 0,550 km / 0,34 miles (Meadow Well – Port).

The scheme of the First Stage of Development is demonstrated on the Figure 5.

The Second Stage of Development.

The Radial line: “BLYTH – SOUTH CRAMLINGTON – PELAW – NEWBOTTLE – PETERLEE”.

The distances between stations: Blyth (the New station) – *3,155 km / 1,96 miles* – Cramlington (the New station) – *0,935 km / 0,98 miles* – South Cramlington (the Expand operating station – the Interchange node) – *1,865 km / 1,16 miles* – Killingworth (the New station) – *1,905 km / 1,18 miles* – Four Lane Ends (the Rebuild operating station – the Interchange node) – *1,690 km / 1,05 miles* – Walkergate (the Rebuild operating station – the Interchange node) – *1,200 km / 0,75 miles* – Walker (the New Station) – *0,980 km / 0,61 miles* – Pelaw (the Rebuild operating station – the Interchange node) – *0,930 km / 0,58 miles* – Leam Lane (the New station – the Interchange node) – *2,155 km / 1,34 miles* – Glebe (the New station – the Interchange node) – *1,055 km / 0,66 miles* – Fatfield (the New station – the Interchange node) – *1,325 km / 0,82 miles* – Shiney Row (the New station) – *0,800 km / 0,50 miles* – Newbottle (the Expand operating station – the Interchange node) – *0,995 km / 0,62 miles* – Houghton-le-Spring (the New station) – *1,320 km / 0,82 miles* – Hetton-le-Hole (the New station) – *1,940 km / 1,21 miles* – Murton (the New station) – *2,810 km / 1,75 miles* – Colliery (the New station) – *1,590 km / 0,99 miles* – Peterlee (the New station).

The location of detour sections and deadlock sections: (Deadlock-1) Blyth – (Deadlock-3) Cramlington(Deadlock-3) – (Deadlock-3) South Cramlington (Deadlock-3) – (Deadlock-3) Killingworth (Deadlock-3) – (Deadlock-3) Four Lane Ends (Deadlock-3) – (Deadlock-3) Walkergate – (Detour-1) – Walker – Pelaw – (Detour-3) – Leam Lane (Deadlock-2) – (Deadlock-3) Glebe (Deadlock-3) – (Deadlock-3) Fatfield (Deadlock-3) – (Deadlock-3) Shiney Row – (Detour-1) – Newbottle(Deadlock-3) – (Deadlock-3) Houghton-le-Spring (Deadlock-3) – (Deadlock-3) Hetton-le-Hole (Deadlock-3) – Murton (Deadlock-3) – (Deadlock-3) Colliery (Deadlock-3) – Peterlee (Deadlock-1).

Placements of inputs and outputs from streets to underground antechambers of new stations: Blyth (*on the Broad Way, between the Plessey Road and the Kingsway*), Cramlington (*on the B1326 High Way, near the Newlyn Drive*), Killingworth (*on the Killingworth Way, between the Woodvale Road Close and the Bannockburn*), Walker (*on the Saint Anthony's Road, between the Wigmore Avenue and the Lancefield Avenue*), Leam Lane (*on the Colegate, between the Wealcroft and the Meresyde*), Glebe (*on the Parkway, between the Roche Court and the Newstead Court*), Fatfield (*on the Fallowfield Way, between the Broadmeadows and the Fernlea Close*), Shiney Row (*on the South View, near the Henry Street*), Houghton-le-Spring (*on the Durham Road, between the Dunholm Close and the Bishops Wyrd*), Hetton-le-Hole (*on the Houghton Road / the Station Road, between the Logan Street and the Station View*), Murton (*on the Barnes Road, between the Webb Avenue and the Toft Crescent*), Colliery (*on the Seaside Lane, between the Whickham Street and the Milton Lane*), Peterlee (*on the Burnhope Way, between the Passfield Way and the Burnhope Close*).

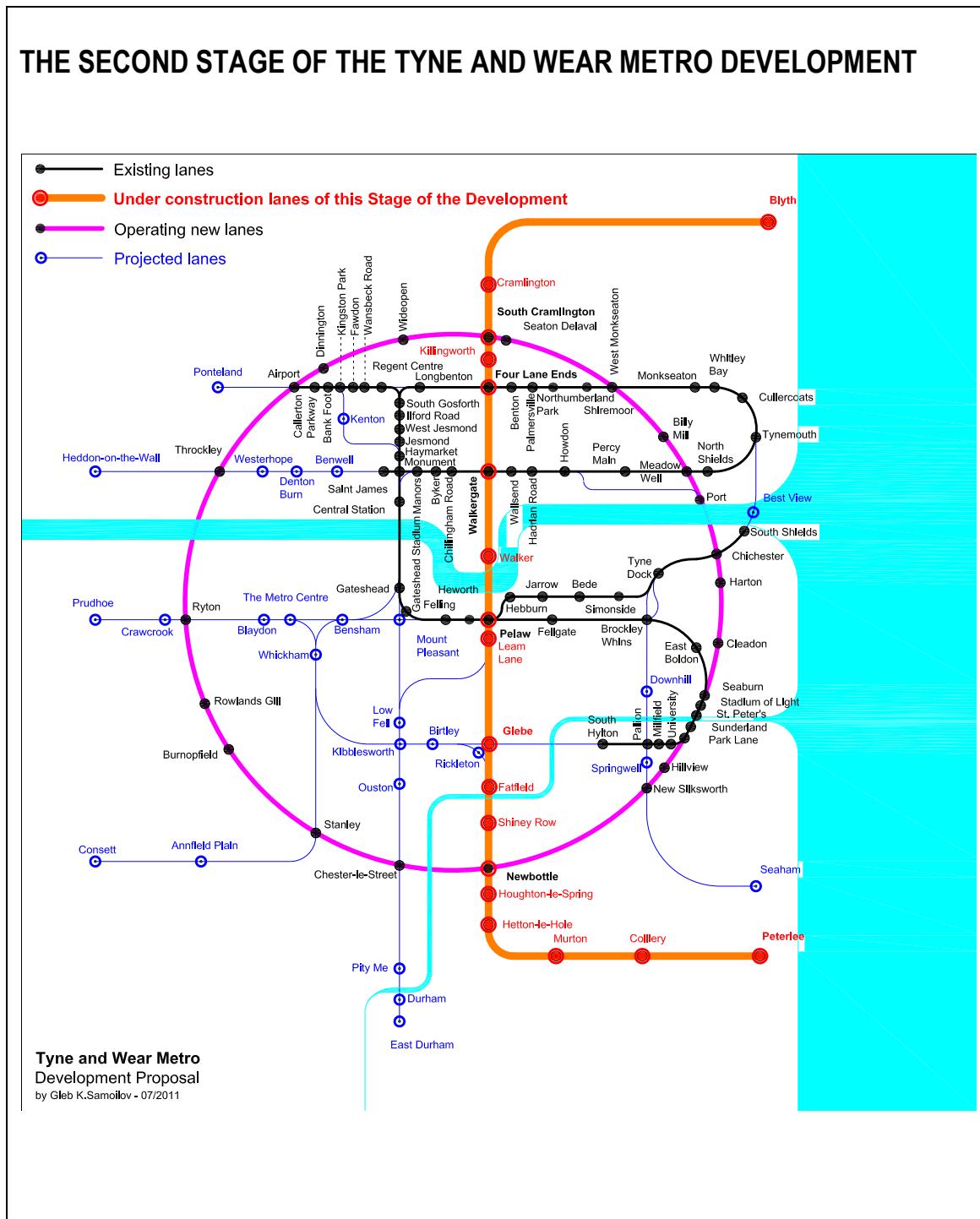


Figure 6.
 The Second stage of the Tyne and Wear Metro development.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Basic data on the line of the Second Stage of Development.

The length of the line – 26,650 km / 16,56 miles.

The number of stations – 18:

- new stations – 13 (Blyth, Cramlington, Killingworth, Walker, Leam Lane, Glebe, Fatfield, Shiney Row, Houghton-le-Spring, Hetton-le-Hole, Murton, Colliery, Peterlee);
- rebuild operating stations – 3 (Four Lane Ends, Walkergate, Pelaw);
- expand operating stations – 2 (South Cramlington, Newbottle).

The number of interchange nodes – 8:

- at new stations – 3 (Leam Lane, Glebe, Fatfield);
- at operating stations – 5 (South Cramlington, Four Lane Ends, Walkergate, Pelaw, Newbottle).

The average distance between stations – 1,568 km / 0,97 miles.

The maximum distance between stations – 3,115 km / 1,96 miles (Blyth – Cramlington).

The minimum distance between stations – 0,800 km / 0,50 miles (Newbottle – Shiney Row).

The scheme of the Second Stage of Development is demonstrated on the Figure 6.

The Third Stage of Development.

The Radial line: "SAINT JAMES – THROCKLEY – HEDDON-ON-THE-WALL".

The distances between stations: Saint James (the Expend operating station) – *1,205 km / 0,75 miles* – Benwell (the New station) – *1,165 km / 0,72 miles* – Denton Burn (the New station) – *1,125 km / 0,70 miles* – Westerhope (the New station) – *1,245 km / 0,77 miles* – Throckley (the Expend operating station – the Interchange node) – *1,460 km / 0,91 miles* – Heddon-on-the-Wall (the New station).

The location of detour sections and deadlock sections: Saint James – (Detour-1) – Benwell (Deadlock-3) – (Deadlock-3) Denton Burn (Deadlock-3) – (Deadlock-3) Westerhope (Deadlock-3) – (Deadlock-3) Throckley (Deadlock-3) – Heddon-on-the-Wall (Deadlock-1).

Placements of inputs and outputs from streets to underground antechambers of new stations: Benwell (*on the West Road, between the Hoyle Avenue and the Condercum Road*), Denton Burn (*on the West Road, near the East Denton Hall*), Westerhope (*on the Hillhead Parkway, between the Caversham Road and the Frenton Close*), Heddon-on-the-Wall (*on the Hexham Road, between the Towne Gate and the Military Road*).

Basic data on the line of the Third Stage of Development.

The length of the line – 6,190 km / 3,84 miles.

The number of stations – 6:

- new stations – 4 (Benwell, Denton Burn, Westerhope, Heddon-on-the-Wall);
- rebuild operating stations – 0 (-);
- expend operating stations – 2 (Saint James, Throckley).

The number of interchange nodes – 1:

- at new stations – 0 (-);
- at operating stations – 1 (Throckley).

The average distance between stations – 1,238 km / 0,77 miles.

The maximum distance between stations – 1,460 km / 0,91 miles (Throckley – Heddon-on-the-Wall).

The minimum distance between stations – 1,165 km / 0,72 miles (Denton Burn – Benwell).

The scheme of the Third Stage of Development is demonstrated on the Figure 7.

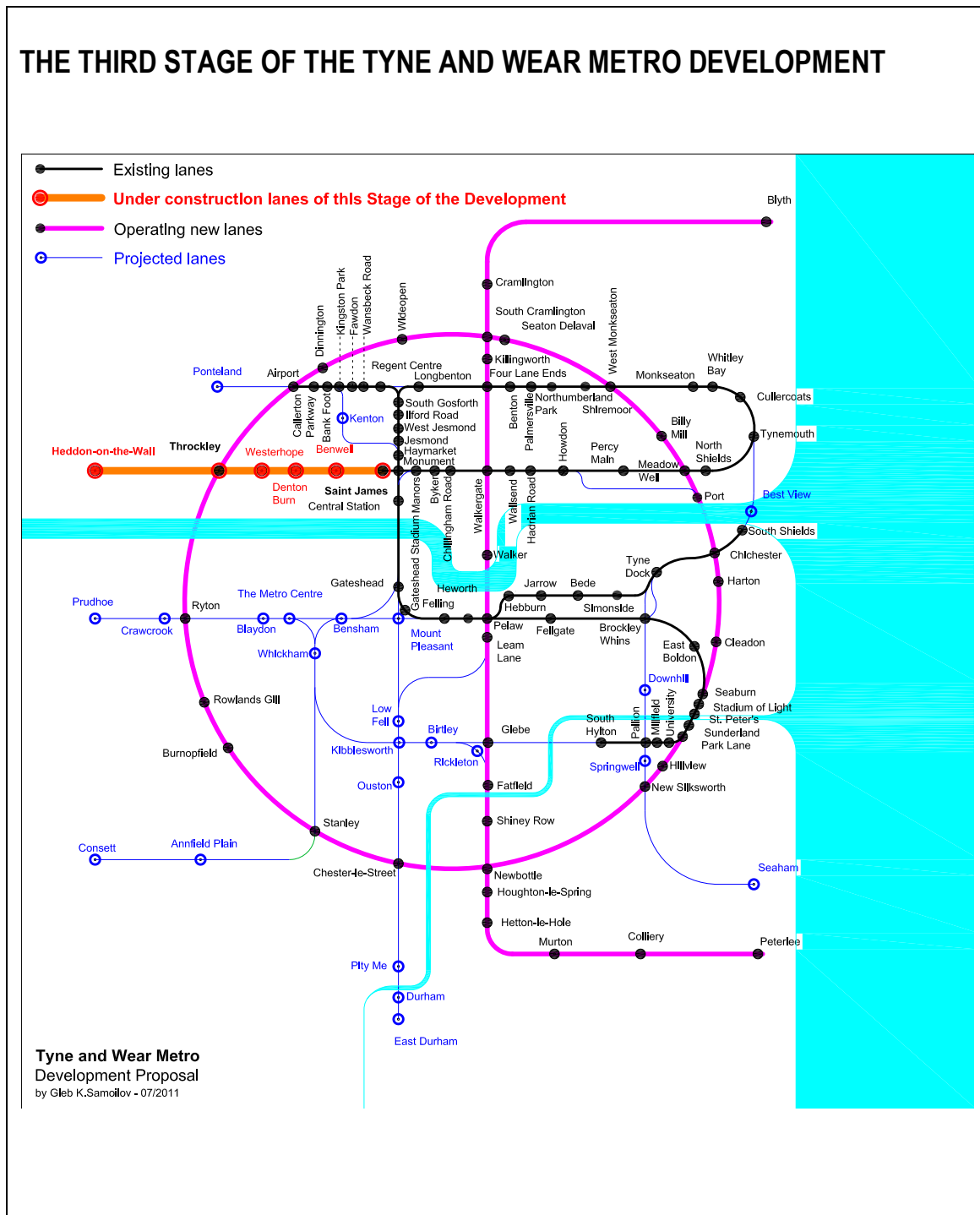


Figure 7.
The Third stage of the Tyne and Wear Metro development

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

THE FOURTH STAGE OF THE TYNE AND WEAR METRO DEVELOPMENT

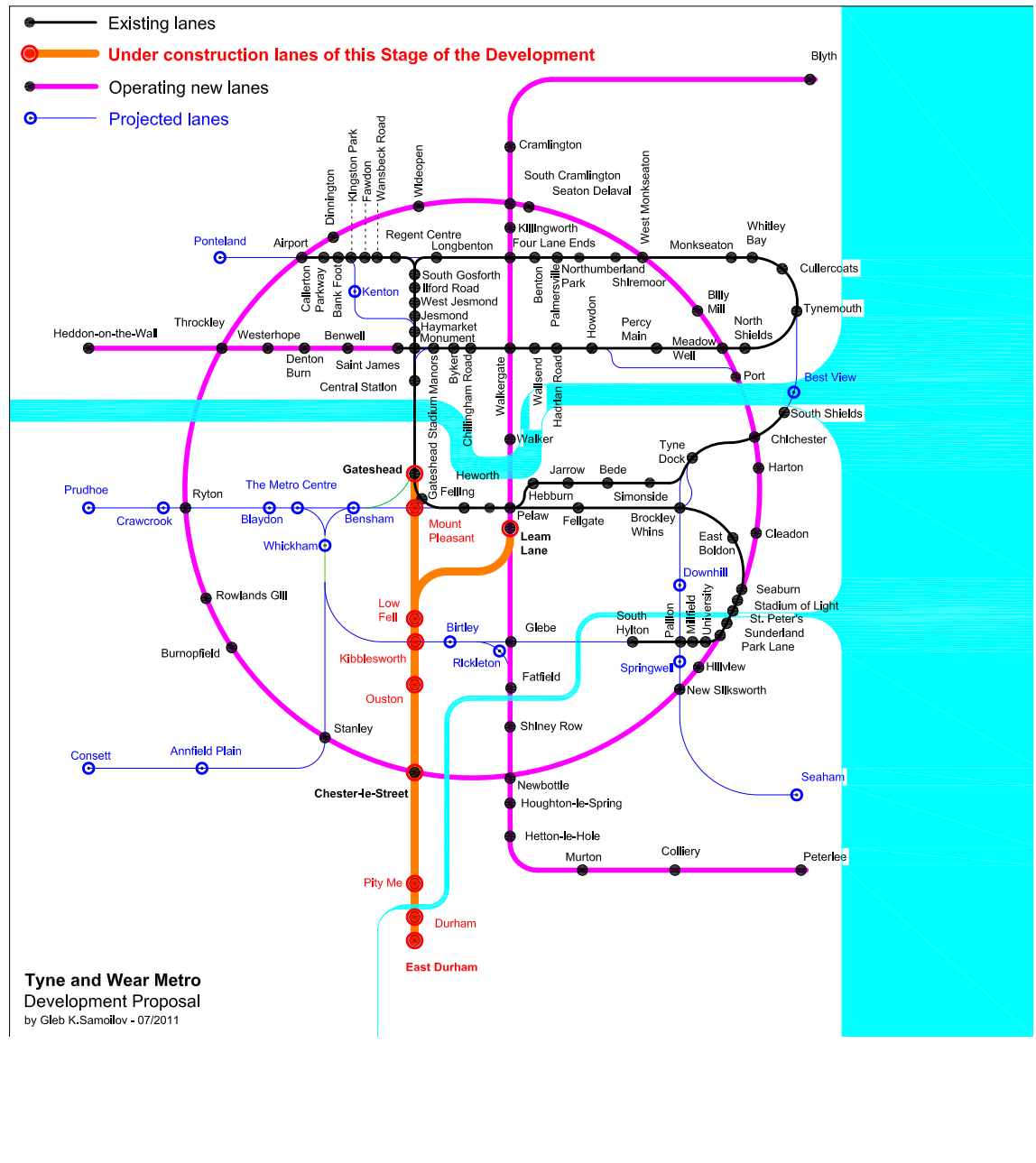


Figure 8.
The Fourth stage of the Tyne and Wear Metro development.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

The Fourth Stage of Development.

The Radial line: "EAST DURHAM – CHESTER-LE-STREET – LOW FELL (branch on LEAM LANE) – GATESHEAD".

The distances between stations: East Durham (the New station) – *1,615 km / 1,00 miles* – Durham (the New station) – *1,230 km / 0,76 miles* – Pity Me (the New station) – *3,005 km / 1,87 miles* – Chester-le-Street (the Expand operating station – the Interchange node) – *1,990 km / 1,24 miles* – Ouston (the New station) – *1,200 km / 0,75 miles* – Kibblesworth (the New station – the Interchange node) – *1,950 km / 1,21 miles* – Low Fell (the New station – the Interchange node) – *1,105 km / 0,96 miles* – Mount Pleasant (the New station – the Interchange node) – *0,600 km / 0,37 miles* – Gateshead (the Rebuild operating station – the Interchange node). Low Fell (the New station – the Interchange node) – *1,520 km / 0,94 miles* – Leam Lane (the Expand operating station – the Interchange node).

The location of detour sections and deadlock sections: (Deadlock-1) East Durham – (Deadlock-3) Durham (Deadlock-3) – (Deadlock-3) Pity Me (Deadlock-3) – (Deadlock-3) Chester-le-Street (Deadlock-3) – (Deadlock-3) Ouston (Deadlock-3) – (Deadlock-3) Kibblesworth (Deadlock-3) – (Deadlock-3) Low Fell – (Detour-1) – Mount Pleasant – Gateshead. Low Fell – (Detour-1) – Leam Lane.

Placements of inputs and outputs from streets to underground antechambers of new stations: East Durham (*on the Broomside Lane, near Community Centre*), Durham (*on the New Elvet, near New Elvet Bridge*), Pity Me (*on the Carr House Drive, between the Bek Road and the Alnwick Road*), Ouston (*on the Bradley Close, near the Leyburn Close*), Kibblesworth (*on the Kibblesworth Bank, near the Post Office*), Low Fell (*on the Engine Lane, between the Kells Lane and the A167 High Way*), Mount Pleasant (*on the Edendale Terrace, near the Art Gallery*).

Basic data on lines of the Fourth Stage of Development.

The length of the line – 14,220 km / 8,83 miles.

The number of stations – 10:

- new stations – 7 (East Durham, Durham, Pity Me, Ouston, Kibblesworth, Low Fell, Mount Pleasant);
- rebuild operating stations – 1 (Gateshead);
- expand operating stations – 2 (Chester-le-Street, Leam Lane).

The number of interchange nodes – 6:

- at new stations – 3 (Kibblesworth, Low Fell, Mount Pleasant);
- at operating stations – 3 (Chester-le-Street, Gateshead, Leam Lane).

The average distance between stations – 1,580 km / 0,98 miles.

The maximum distance between stations – 3,005 km / 1,87 miles (Chester-le-Street – Pity Me).

The minimum distance between stations – 0,600 km / 0,37 miles (Mount Pleasant – Gateshead).

The scheme of the Fourth Stage of Development is demonstrated on the Figure 8.

The Fifth Stage of Development.

The Radial line: "SOUTH HYLTON – GLEBE – BIRTLEY (branch on FATFIELD) – KIBBLESWORTH – THE METRO CENTRE – RYTON – PRUDHOE".

The distances between stations: South Hylton (the Expand operating station) – *2,775 km / 1,72 miles* – Glebe (the Expand operating station – the Interchange node) – *1,585 km / 0,98 miles* – Birtley (the New station – the Interchange node) – *1,560 km / 0,97 miles* – Kibblesworth (the Expand operating station – the Interchange node) – *2,565 km / 1,59 miles* – Whickham (the New station – the Interchange node) – *0,815 km / 0,51 miles* – The Metro

THE FIFTH STAGE OF THE TYNE AND WEAR METRO DEVELOPMENT

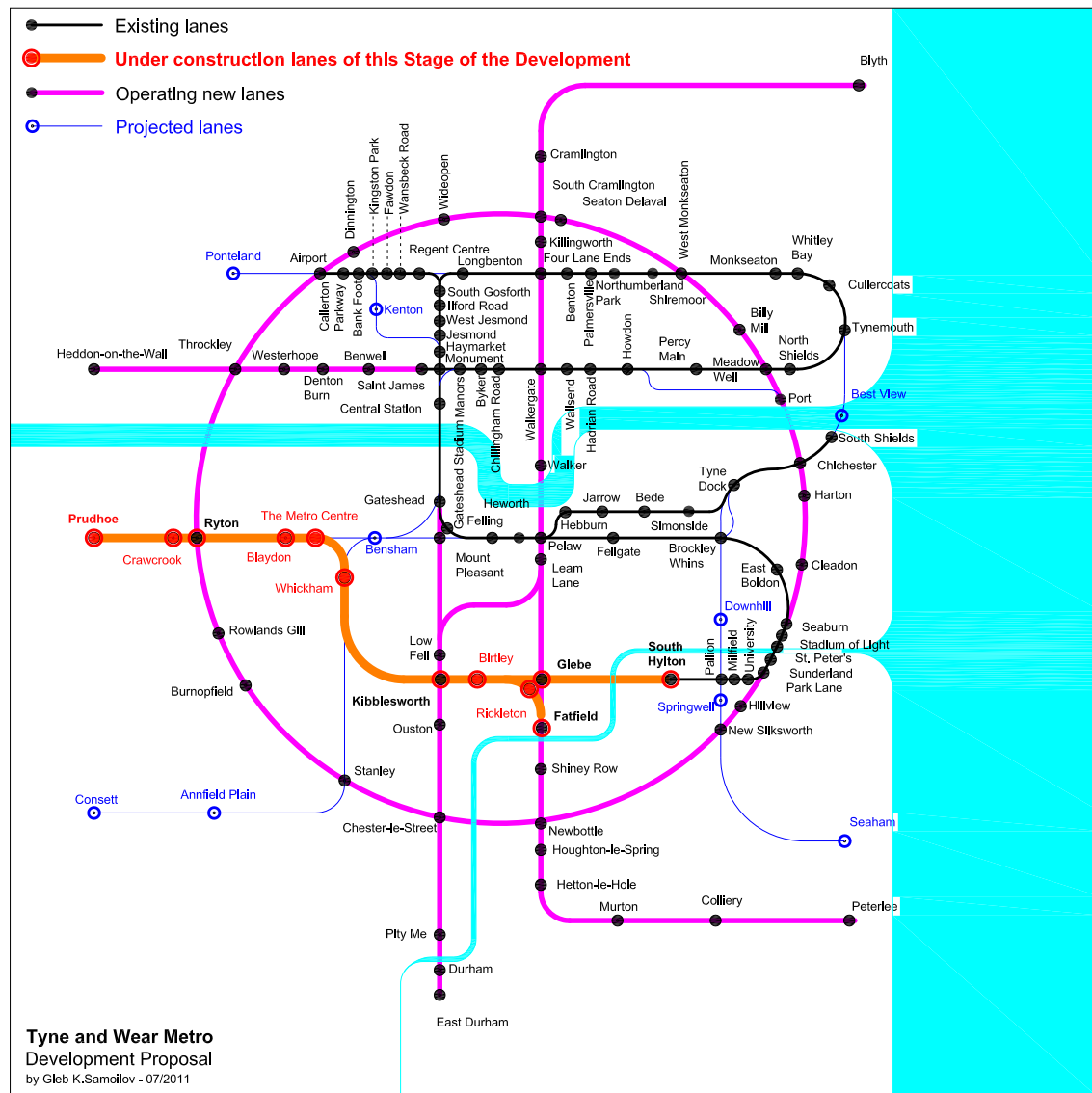


Figure 9.
The Fifth stage of the Tyne and Wear Metro development.

*Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).*

Centre (the New station – the Interchange node) – *1,505 km / 0,94 miles* – Blaydon (the New station) – *1,560 km / 0,97 miles* – Ryton (the Expand operating station – the Interchange node) – *1,075 km / 0,67 miles* – Crawcrook (the New station) – *2,040 km / 1,27 miles* – Prudhoe (the New station). Birtley (the New station – the Interchange node) – *1,450 km / 0,90 miles* – Rickleton (the New station) – *1,660 km / 1,03 miles* – Fatfield (the Expand operating station – the Interchange node).

The location of detour sections and deadlock sections: South Hylton (Deadlock-3) – (Detour-1) – Glebe – (Detour-1) – Birtley (Deadlock-3) – (Deadlock-3) Kibblesworth (Deadlock-3) – (Deadlock-2) Whickham – The Metro Centre – (Detour-1) – Blaydon (Deadlock-3) – (Deadlock-3) Ryton (Deadlock-3) – (Deadlock-3) Crawcrook (Deadlock-3) – Prudhoe (Deadlock-1). Birtley – (Deadlock-3) Rickleton (Deadlock-3) – Fatfield.

Placements of inputs and outputs from streets to underground antechambers of new stations: Birtley (*on the Durham Road, between the Edward Road and the Mitchell Street*), Whickham (*on the Whickham Highway, between the Washingwell Lane and the Coniston Avenue*), The Metro Centre (*inside The Metro Centre*), Blaydon (*on the Pine Road, between the Sycamore Road and the Maple Road*), Crawcrook (*on the Kaper Chare, near the Main Street*), Prudhoe (*on the Station Road, between Western Avenue and the Cranleigh Grove*), Rickleton (*on the Rickleton Way, between the Coquet and the Alwin*).

Basic data on lines of the Fifth Stage of Development.

The length of the line – 18,850 km / 11,85 miles.

The number of stations – 12:

- new stations – 7 (Birtley, Whickham, The Metro Centre, Blaydon, Crawcrook, Prudhoe, Rickleton);
- rebuild operating stations – 0 (-);
- expand operating stations – 5 (South Hylton, Glebe, Kibblesworth, Ryton, Fatfield).

The number of interchange nodes – 7:

- at new stations – 3 (Birtley, Whickham, The Metro Centre);
- at operating stations – 4 (Glebe, Kibblesworth, Ryton, Fatfield).

The average distance between stations – 1,689 km / 1,05 miles.

The maximum distance between stations – 2,775 km / 1,72 miles (Glebe – South Hylton).

The minimum distance between stations – 0,815 km / 0,51 miles (The Metro Centre – Whickham).

The scheme of the Fifth Stage of Development is demonstrated on the Figure 9.

The Sixth Stage of Development.

The Radial line: “SEAHAM – NEW SILKSWORTH – PALLION – TYNE DOCK”.

The distances between stations: Seaham (the New station) – *2,865 km / 1,78 miles* – New Silksworth (the Expand operating station – the Interchange node) – *1,380 km / 0,86 miles* – Springwell (the New station) – *1,225 km / 0,76 miles* – Pallion (the Rebuild operating station – the Interchange node) – *1,435 km / 0,89 miles* – Downhill (the New station) – *2,525 km / 1,57 miles* – Brockley Whins (the Rebuild operating station – the Interchange node) – *1,205 km / 0,75 miles* – Tyne Dock (the Rebuild operating station – the Interchange node).

The location of detour sections and deadlock sections: (Deadlock-1) Seaham – (Deadlock-3) New Silksworth (Deadlock-3) – (Deadlock-3) Springwell (Deadlock-3) – (Deadlock-3) Pallion – (Deadlock-3) Downhill (Deadlock-3) – (Deadlock-3) Brockley Whins – (Detour-1) – Tyne Dock.

Placements of inputs and outputs from streets to underground antechambers of new stations: Seaham (*on the North Railway Street, between the Henry Street and Back North Terrace*), Springwell (*on the Springwell Road, between the Somerset Road and Sutherland*

THE SIXTH STAGE OF THE TYNE AND WEAR METRO DEVELOPMENT

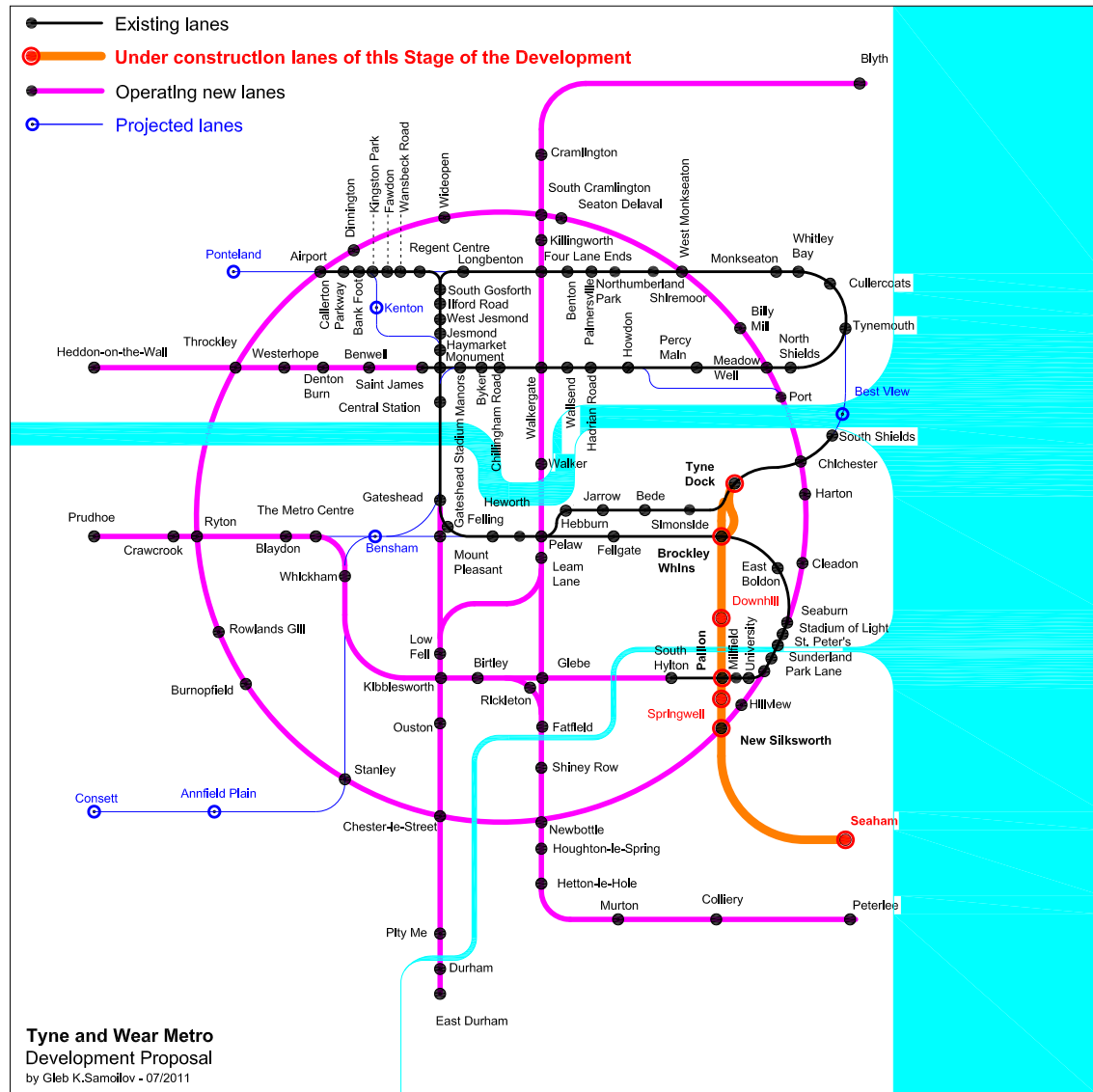


Figure 10.
The Sixth stage of the Tyne and Wear Metro development

*Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).*

Drive), Downhill (on the Hylton Lane, near the Council Office).

Basic data on the line of the Sixth Stage of Development.

The length of the line – 10,635 km / 6,61 miles.

The number of stations – 7:

- new stations – 3 (Seaham, Springwell, Downhill);
- rebuild operating stations – 3 (Pallion, Brockley Whins, Tyne Dock);
- expand operating stations – 1 (New Silksworth).

The number of interchange nodes – 4:

- at new stations – 0 (-);
- at operating stations – 4 (New Silksworth, Pallion, Brockley Whins, Tyne Dock).

The average distance between stations – 1,773 km / 1,10 miles.

The maximum distance between stations – 2,865 km / 1,78 miles (Seaham – New Silksworth).

The minimum distance between stations – 1,205 km / 0,75 miles (Tyne Dock – Brockley Whins).

The scheme of the Sixth Stage of Development is demonstrated on the Figure 10.

The Seventh Stage of Development.

The Radial line: “CONSETT – STANLEY – WHICKHAM – CENTRAL STATION – MANORS (branch on THE METRO CENTRE – BENSHAM – FELLING)”.

The distances between stations: Consett (the New station) – *3,180 km / 1,98 miles* – Annfield Plain (the New station) – *1,830 km / 1,14 miles* – Stanley (the Expand operating station – the Interchange node) – *4,535 km / 2,82 miles* – Whickham (the Expand operating station – the Interchange node) – *1,530 km / 0,95 miles* – Bensham (the New station) – *0,805 km / 0,50 miles* – Central Station (the

Rebuild operating station – the Interchange node) – *0,600 km / 0,37 miles* – Manors (the Rebuild operating station – the Interchange node). The Metro Centre (the Expand operating station – the Interchange node) – 1,605 km / 1,00 miles – Bensham (the New station) – 0,630 km / 0,39 miles – Mount Pleasant (the Expand operating station – the Interchange node) – 0,945 km / 0,59 miles – Felling (the Rebuild operating station – the Interchange node).

The location of detour sections and deadlock sections: (Deadlock-1) Consett – (Deadlock-3) Annfield Plain (Deadlock-3) – (Deadlock-3) Stanley (Deadlock-3) – (Deadlock-3) Whickham – (Detour-1) Bensham – Central Station – Manors. The Metro Centre – Bensham – Mount Pleasant (Detour-2) – Felling.

Placements of inputs and outputs from streets to underground antechambers of new stations: Consett (*on the Manse Street, near the Park Street*), Annfield Plain (*on the New Front Street, near the Queens Parade*), Bensham (*on the Hazel Road, between the Kyle Road and the Bensham Crescent*).

Basic data on lines of the Seventh Stage of Development.

The length of the line – 15,115 km / 9,39 miles.

The number of stations – 10:

- new stations – 3 (Consett, Annfield Plain, Bensham);
- rebuild operating stations – 3 (Central Station, Manors, Felling);
- expand operating stations – 4 (Stanley, Whickham, The Metro Centre, Mount Pleasant).

The number of interchange nodes – 8:

- at new stations – 1 (Bensham);
- at operating stations – 7 (Stanley, Whickham, Central Station, Manors, The Metro Centre, Mount Pleasant, Felling).

THE SEVENTH STAGE OF THE TYNE AND WEAR METRO DEVELOPMENT

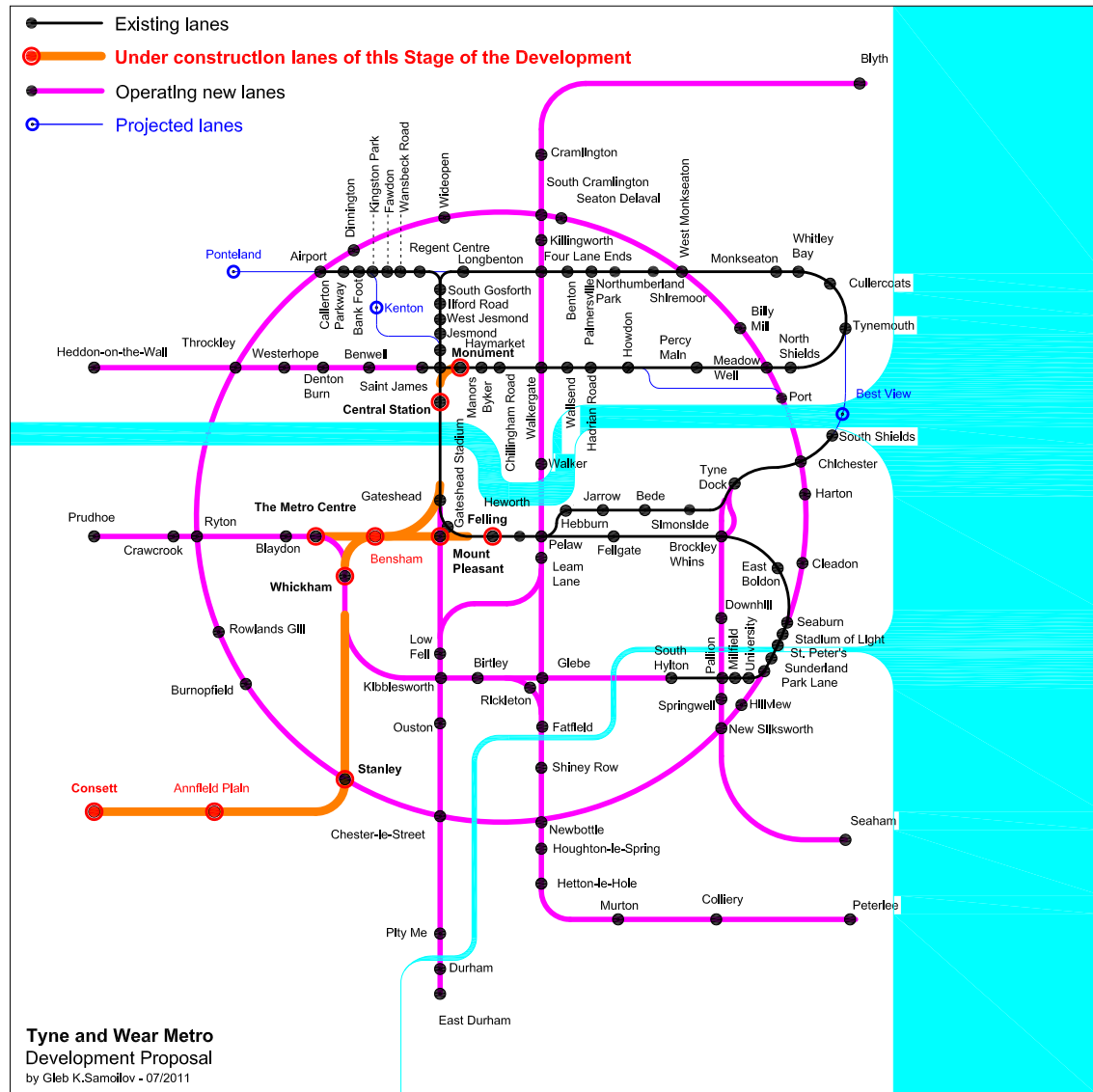


Figure 11.
The Seventh stage of the Tyne and Wear Metro development.

*Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).*

The average distance between stations – 2,159 km / 1,34 miles.

The maximum distance between stations – 4,535 km / 2,82 miles (Whickham – Stanley).

The minimum distance between stations – 0,600 km / 0,37 miles (Central Station – Manors).

The scheme of the Seventh Stage of Development is demonstrated on the Figure 11.

The Eighth Stage of Development.

Branches of radial lines:

"AIRPORT – PONTELAND";

"BANK FOOT – HAYMARKET";

"HOWDON – PORT";

"SOUTH SHIELDS – TYNEMOUTH";

"REGENT CENTRE – LONGBENTON".

The distances between stations: Airport (the Expand operating station – the Interchange node) – *1,600 km / 0,99 miles* – Ponteland (the New station). Bank Foot (the Rebuild operating station – the Interchange node) – *1,115 km / 0,69 miles* – Kenton (the New station) – *1,875 km / 1,17 miles* – Haymarket (the Rebuild operating station – the Interchange node). Howdon (the Rebuild operating station – the Interchange node) – *0,850 km / 0,53 miles* – Port (the Expand operating station – the Interchange node).

South Shields (the Expand operating station) – *0,495 km / 0,30 miles* – Best View (the New station) – *0,490 km / 0,31 miles* – Tynemouth (the Rebuild operating station – the Interchange node). Regent Centre (the Rebuild operating station – the Interchange node) – *0,825 km / 0,51 miles* – Longbenton (the Rebuild operating station – the Interchange node). On this site (stations and track) produced minimal reconstruction, because there is a connection of stations through the existing Depot.

The location of deadlock sections and detour sections: Airport (Deadlock-3) – Ponteland (Deadlock-1). Bank Foot (Deadlock-3) – (Deadlock-3) Kenton – (Deadlock-1) – Haymarket. Howdon – (Deadlock-3) Port. South Shields – Best View – Tynemouth. Regent Centre – (Detour-1) – Longbenton.

Placements of inputs and outputs from streets to underground antechambers of new stations: Ponteland (*on the Middle Drive, between The Wynde and Sycamore Avenue*), Kenton (*on the Houghton Avenue, near the Community Centre*), Best View (*on the New Tyne Bridge*).

Basic data on the lines of the Eighth Stage of Development.

The length of lines – 8,175 km / 5,08 miles.

The number of stations – 12:

- new stations – 3 (Ponteland, Kenton, Best View);
- rebuild operating stations – 7 (Bank Foot, Haymarket, Howdon, South Shields, Tynemouth, Regent Centre, Longbenton);
- expand operating stations – 2 (Airport, Port).

The number of interchange nodes – 8:

- at new stations – 0 (-);
- at operating stations – 6 (Airport, Bank Foot, Haymarket, Howdon, Port, Tynemouth, Regent Centre, Longbenton).

The average distance between stations – 1,022 km / 0,64 miles.

The maximum distance between stations – 1,875 km / 1,17 miles (Haymarket – Kenton).

The minimum distance between stations – 0,475 km / 0,30 miles (South Shields – Best View).

The scheme of the Eighth Stage of Development is demonstrated on the Figure 12.

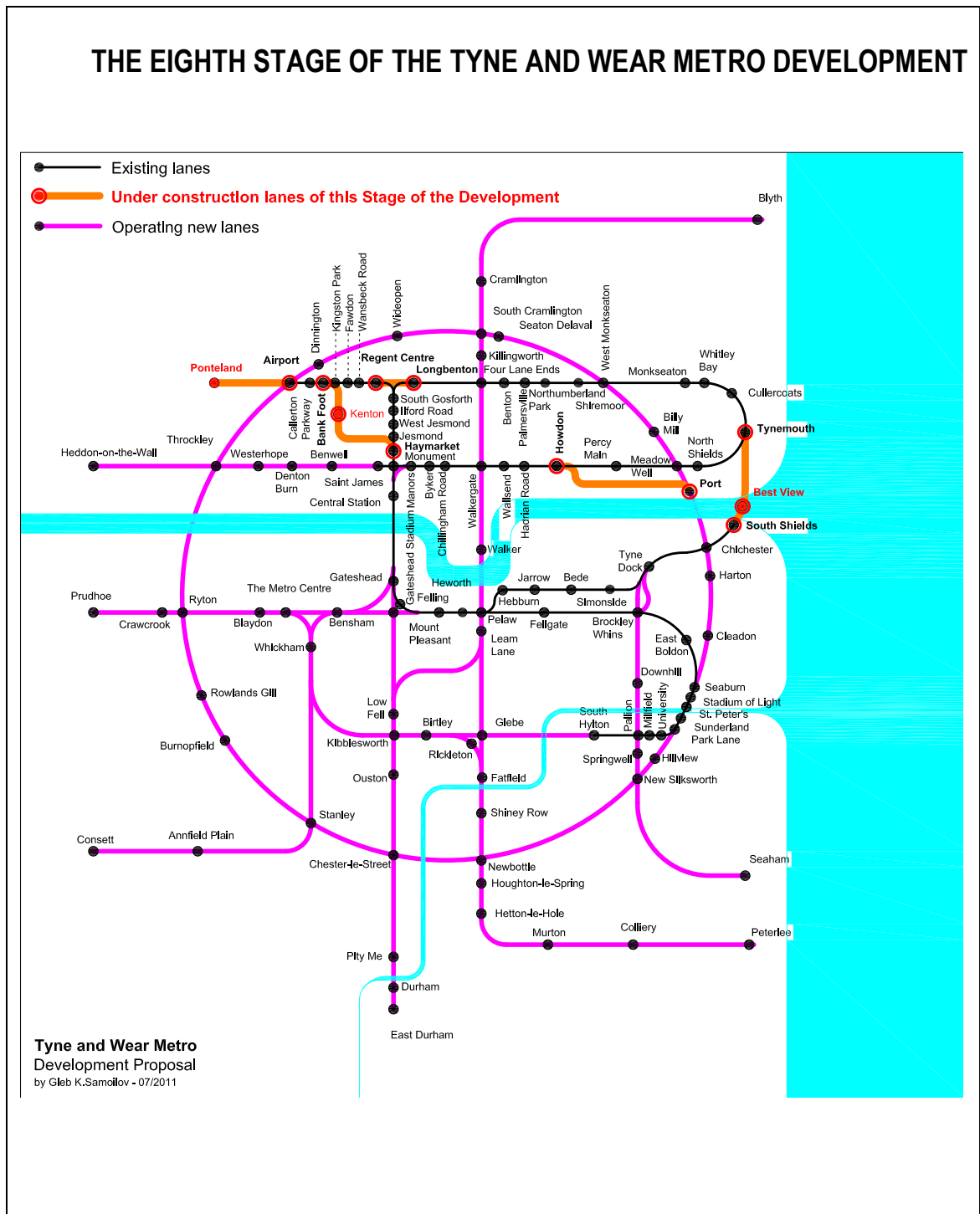


Figure 12.
 The Eighth stage of the Tyne and Wear Metro development.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

There is another procedure for implementing of the Concept. This releases only three stages – the Diametrical line, several Radial branches and connects the Ring.

The First Stage of the Metro Development is THE POSSIBLE VARIANT. This is – the combination of the Second and Fourth stages of the Development in the Basic version.

The First Stage of Development (the Alternative).

The Radial (Diametral) line – “BLYTH – SOUTH CRAMLINGTON – FOUR LANE ENDS – WALKERGATE – PELAW – LEAM LANE – LOW FELL – KIBBLESWORTH – CHESTER-LE-STREET – EAST DURHAM”: Blyth – *3,155 km / 1,96 miles* – Cramlington – *0,935 km / 0,98 miles* – South Cramlington (the Interchange node) – *1,865 km / 1,16 miles* – Killingworth – *1,905 km / 1,18 miles* – Four Lane Ends (the Interchange node) – *1,690 km / 1,05 miles* – Walkergate (the Interchange node) – *1,200 km / 0,75 miles* – Walker – *0,980 km / 0,61 miles* – Pelaw (the Interchange node) – *0,930 km / 0,58 miles* – Leam Lane (the Interchange node) – *1,520 km / 0,94 miles* – Low Fell (the Interchange node) – *1,950 km / 1,21 miles* – Kibblesworth (the Interchange node) – *1,200 km / 0,75 miles* – Ouston – *1,990 km / 1,24 miles* – Chester-le-Street (the Interchange node) – *3,005 km / 1,87 miles* – Pity Me – *1,230 km / 0,76 miles* – Durham – *1,615 km / 1,00 miles* – East Durham. The scheme of the First Stage of Development (the Alternative) is demonstrated on the Figure 13.

The Second Stage of the Metro Development is THE POSSIBLE VARIANT. This is – the combination of the Second, Third, Fourth, Fifth, Sixth, Seventh and Eighth stages of the Development in the Basic version.

The Second Stage of Development (the Alternative).

Several Radial branches.

The Radial line-1 – “LEAM LANE – GLEBE – FATFIELD – NEWBOTTLE – HETTON-LE-HOLE – PETERLEE”: Leam Lane (the Interchange node) – *2,155 km / 1,34 miles* – Glebe (the Interchange node) – *1,055 km / 0,66 miles* – Fatfield (the Interchange node) – *1,325 km / 0,82 miles* – Shiney Row – *0,800 km / 0,50 miles* – Newbottle (the Interchange node) – *0,995 km / 0,62 miles* – Houghton-le-Spring – *1,320 km / 0,82 miles* – Hetton-le-Hole – *1,940 km / 1,21 miles* – Murton – *2,810 km / 1,75 miles* – Easington Colliery – *1,590 km / 0,99 miles* – Peterlee.

The Radial line-2 – “LOW FELL – MOUNT PLEASANT – GATESHEAD”: Low Fell (the Interchange node) – *1,105 km / 0,96 miles* – Mount Pleasant (the Interchange node) – *0,600 km / 0,37 miles* – Gateshead (the Interchange node).

The Radial line-3 – “SAINT JAMES – THROCKLEY – HEDDON-ON-THE-WALL”: Saint James – *1,205 km / 0,75 miles* – Benwell – *1,165 km / 0,72 miles* – Denton Burn – *1,125 km / 0,70 miles* – Westerhope – *1,245 km / 0,77 miles* – Throckley (the Interchange node) – *1,460 km / 0,91 miles* – Heddon-on-the-Wall.

The Radial line-4 – “SOUTH HYLTON – GLEBE – BIRTLEY (branch on FATFIELD) – KIBBLESWORTH – THE METRO CENTRE – RYTON – PRUDHOE”: South Hylton – *2,775 km / 1,72 miles* – Glebe (the Interchange node) – *1,585 km / 0,98 miles* – Birtley (the Interchange node) – *1,560 km / 0,97 miles* – Kibblesworth (the Interchange node) – *2,565 km / 1,59 miles* – Whickham (the Interchange node) – *0,815 km / 0,51 miles* – The Metro Centre (the Interchange node) – *1,505 km / 0,94 miles* – Blaydon – *1,560 km / 0,97 miles* – Ryton (the Interchange node) – *1,075 km / 0,67 miles* – Crawcrook – *2,040 km / 1,27 miles* – Prudhoe. Birtley (the Interchange node) – *1,450 km / 0,90 miles* – Rickleton – *1,660 km / 1,03 miles* – Fatfield (the Interchange node).

The Radial line-5 – “SEAHAM – NEW SILKSWORTH – PALLION – TYNE DOCK”: Seaham – *2,865 km / 1,78 miles* – New Silksworth (the Interchange node) – *1,380 km / 0,86

THE ALTERNATIVE STAGING OF THE TYNE AND WEAR METRO DEVELOPMENT: THE SECOND STAGE OF THE DEVELOPMENT

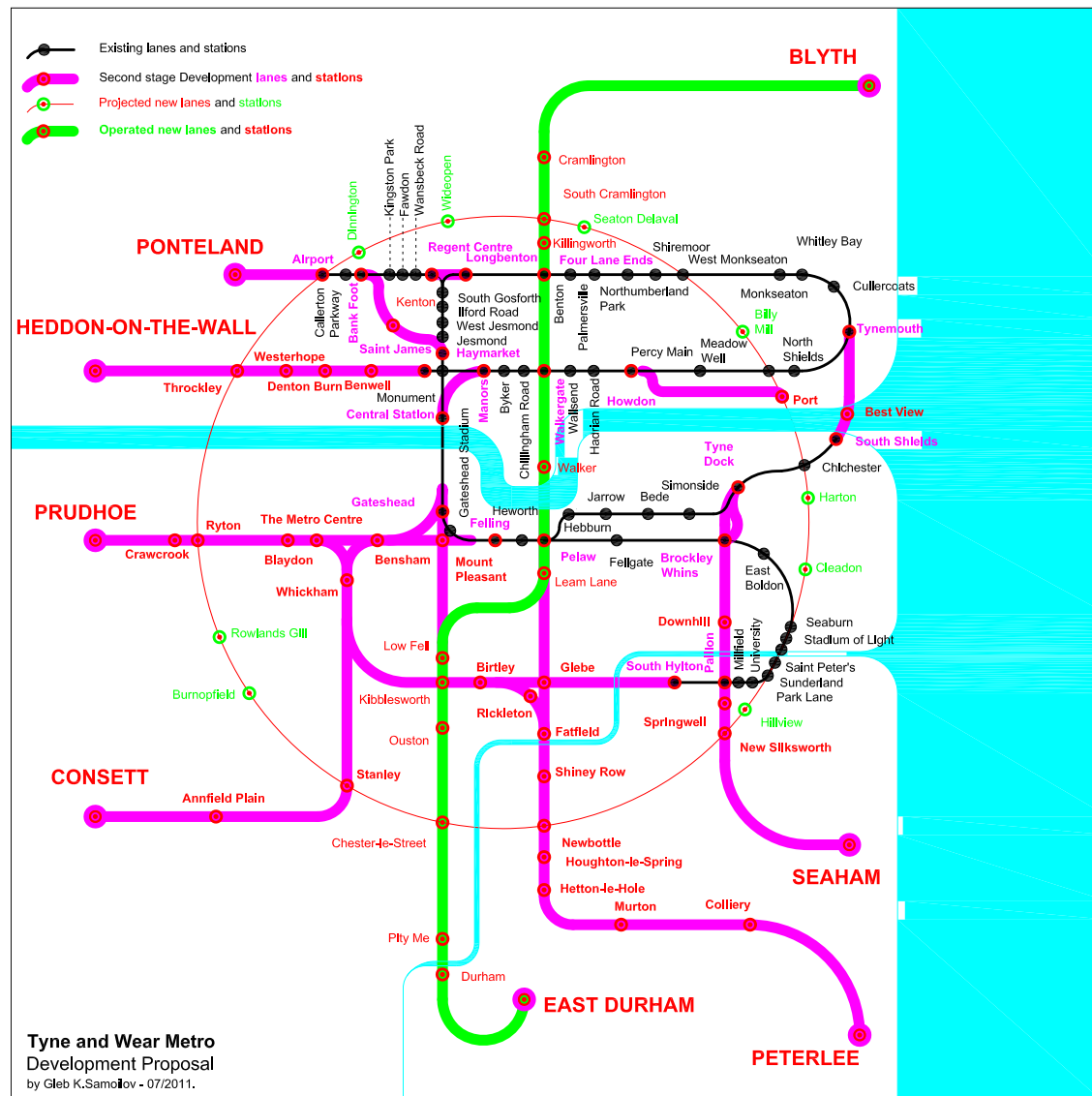


Figure 14.
The Alternative staging of the Tyne and Wear Metro development:
the Second stage of the Development.
Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

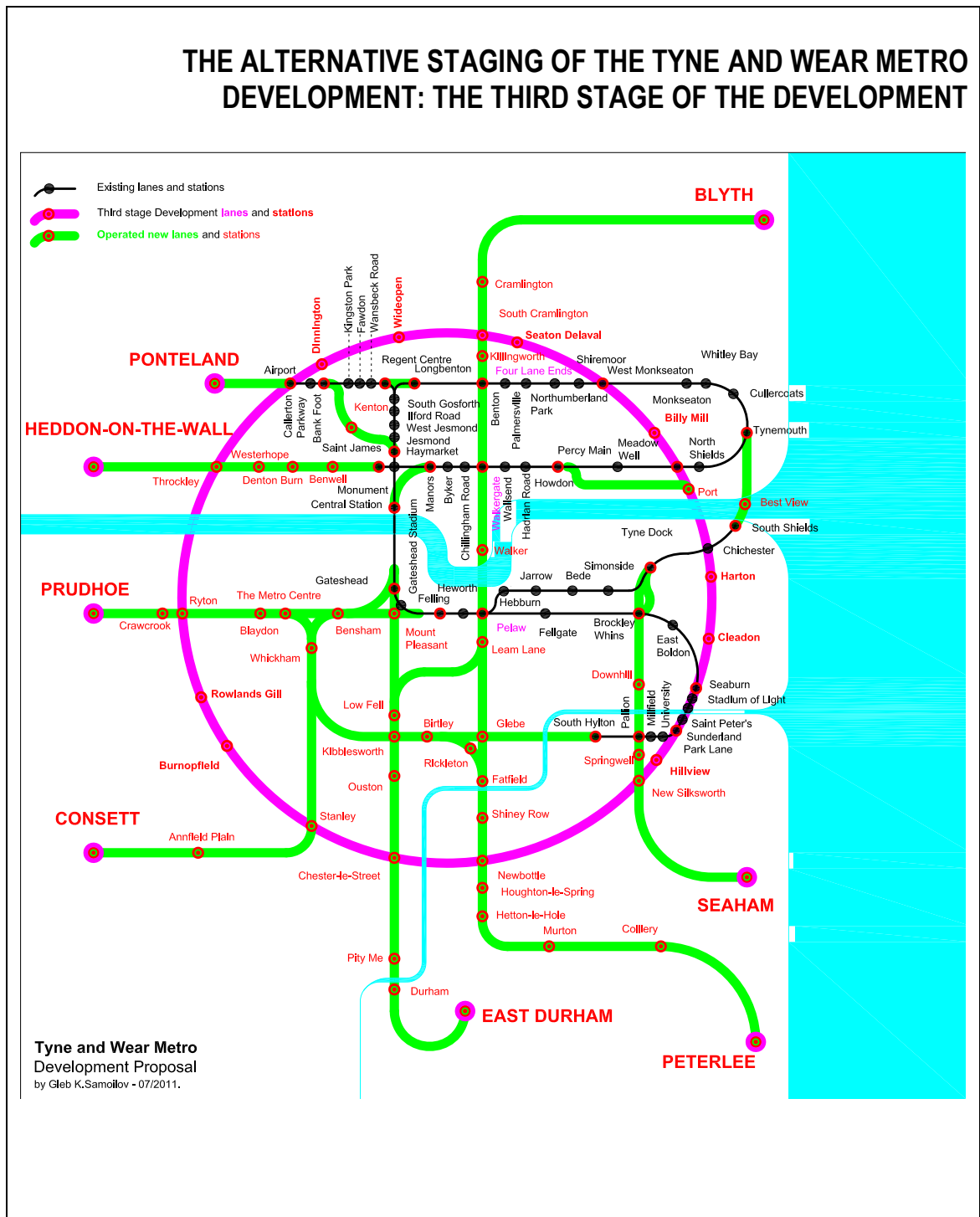


Figure 15.
The Alternative staging of the Tyne and Wear Metro development:
the Third stage of the Development.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).

miles* – Springwell – *1,225 km / 0,76 miles* – Pallion (the Interchange node) – *1,435 km / 0,89 miles* – Downhill – *2,525 km / 1,57 miles* – Brockley Whins (the Interchange node) – *1,205 km / 0,75 miles* – Tyne Dock (the Interchange node).

The Radial line-6 – “CONSETT – STANLEY – WHICKHAM – CENTRAL STATION – MANORS (branch on THE METRO CENTRE – BENSAM – FELLING)”: Consett – *3,180 km / 1,98 miles* – Annfield Plain – *1,830 km / 1,14 miles* – Stanley (the Interchange node) – *4,535 km / 2,82 miles* – Whickham (the Interchange node) – *1,530 km / 0,95 miles* – Bensham – *0,805 km / 0,50 miles* – Central Station (the Interchange node) – *0,600 km / 0,37 miles* – Manors (the Interchange node); The Metro Centre (the Interchange node) – 1,605 km / 1,00 miles – Bensham – 0,630 km / 0,39 miles – Mount Pleasant (the Interchange node) – 0,945 km / 0,59 miles – Felling (the Interchange node).

Branches of radial lines: “AIRPORT – PONTELAND”: Airport (the Interchange node) – *1,600 km / 0,99 miles* – Ponteland; “BANK FOOT – HAYMARKET”: Bank Foot (the Interchange node) – *1,115 km / 0,69 miles* – Kenton – *1,875 km / 1,17 miles* – Haymarket (the Interchange node); “HOWDON – PORT”: Howdon (the Interchange node) – *0,850 km / 0,53 miles* – Port (the Interchange node); “SOUTH SHIELDS – TYNEMOUTH”: South Shields – *0,495 km / 0,30 miles* – Best View – *0,490 km / 0,31 miles* – Tynemouth (the Interchange node); “REGENT CENTRE – LONGBENTON”: Regent Centre (the Interchange node) – *0,825 km / 0,51 miles* – Longbenton (the Interchange node). The scheme of the Second Stage of Development (the Alternative) is demonstrated on the Figure 14.

The Third Stage of the Metro Development is THE POSSIBLE VARIANT. This is – the First stage of the Development in the Basic version.

The Third Stage of Development (the Alternative).

The Ring line, uniting all radial branches – “SEABURN – PORT – SOUTH CRAMLINGTON – AIRPORT – RYTON – NEWBOTTLE – PARK LANE”: Seaburn (the Interchange node) – *1,275 km / 0,79 miles* – Cleadon – *1,445 km / 0,90 miles* – Harton – *0,985 km / 0,61 miles* – Chichester (the Interchange node) – *0,915 km / 0,57 miles* – Port (the Interchange node) – *0,550 km / 0,34 miles* – Meadow Well (the Interchange node) – *1,000 km / 0,62 miles* – Billy Mill – *1,330 km / 0,83 miles* – West Monkseaton (the Interchange node) – *2,460 km / 1,53 miles* – Seaton Delaval – *1,980 km / 1,23 miles* – South Cramlington (the Interchange node) – *2,135 km / 1,33 miles* – Wideopen – *1,680 km / 1,04 miles* – Dinnington – *1,710 km / 1,06 miles* – Airport (the Interchange node) – *2,700 km / 1,68 miles* – Throckley (the Interchange node) – *1,275 km / 0,79 miles* – Ryton (the Interchange node) – *3,040 km / 1,89 miles* – Rowlands Gill – *1,470 km / 0,91 miles* – Burnopfield – *2,570 km / 1,060 miles* – Stanley (the Interchange node) – *3,560 km / 2,21 miles* – Chester-le-Street (the Interchange node) – *3,425 km / 2,13 miles* – Newbottle (the Interchange node) – *2,870 km / 1,78 miles* – New Silksworth (the Interchange node) – *1,085 km / 0,67 miles* – Hillview – *0,765 km / 0,48 miles* – Park Lane (the Interchange node). The scheme of the Third Stage of Development (the Alternative) is demonstrated on the Figure 15.

After completing the bulk of the work on the Eighth stage of the Tyne and Wear Metro Development appropriate to make underground and most of the existing Metro lines. It can be classified as **the Ninth Stage of Development or the Final part of Eighth Stage of Basic Version** (the Final part of Third Stage of the Alternative Version).

In this trace does not change.

Underground will be the following sites: AIRPORT – Callerton Parkway – Bank Foot – Kingston Park – Fawdon – Wansbeck Road – REGENT CENTRE; SOUTH GOSFORTH – Ilford Road – West Jesmond – JESMOND; LONGBENTON – Four Lane Ends – BENTON;

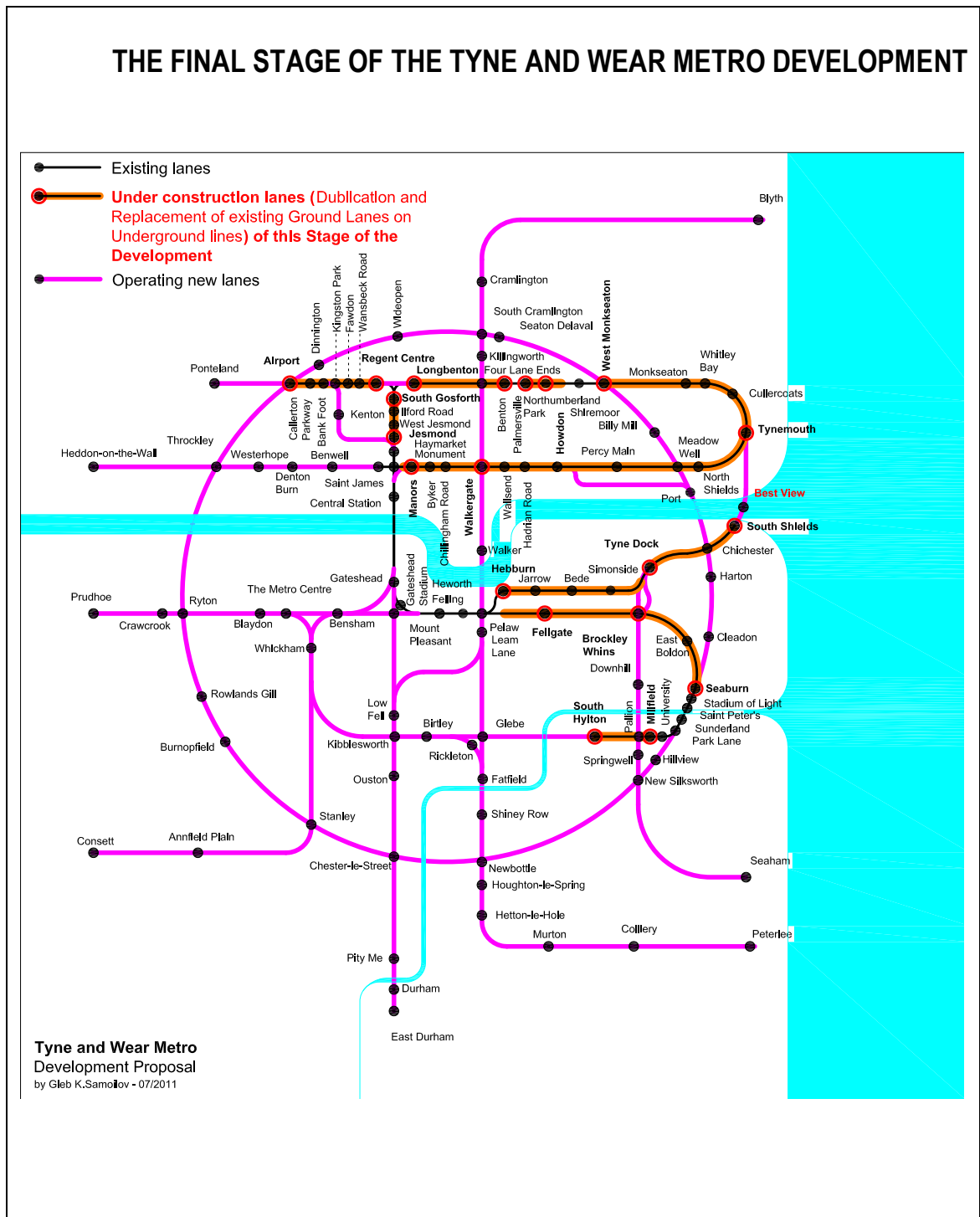


Figure 16.
 The Final stage of the Tyne and Wear Metro development.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

PALMERSVILLE – Northumberland Park – Shiremoor – West Monkseaton – Whitley Bay – Cullercoats – Tynemouth – North Shields – Meadow Well – Percy Main – Howdon – Hadrian Road – Wallsend – Walkergate – Chillingham Road – Byker – MANORS; HEBBURN – Jarrow – Bede – Simonside – TYNE DOCK – Chichester – SOUTH SHIELDS; PELAW – Fellgate – BROCKLEY WHINS – East Boldon – Seaburn – Stadium of Light – SAINT PETER’S; MILLFIELD – Pallion – SOUTH HYLTON.

The underground section (PELAW – Fellgate – BROCKLEY WHINS – East Boldon – Seaburn – Stadium of Light – SAINT PETER’S) to the joint operation with Railway Companies.

No change in ground situation will remain the following sites: REGENT CENTRE – LONGBENTON – SOUTH GOSFORTH – REGENT CENTRE (connection to the Depot); BENTON – PALMERSVILLE; GATESHEAD STADIUM – Felling – Heworth – PELAW (Difficult connections with the Railway network).

The tunnels are performed in small depth with underground stations and lobbies. On the surface leaving only the pavilions for Entry & Exit. The construction of new tunnels directly on the route of the old land routes is of great social and economic importance. Economic benefits include the possibility for building works “open way” on a prepared site. Social benefits include preservation of the usual location for the residents of Metro stations. The scheme of the Ninth Stage of Development is demonstrated on the Figure 16.

The Development Result of the Tyne and Wear Metro network will be the emergence of a regional system “**NORTHUMBERLAND – TYNE and WEAR – DURHAM METRO**”. It allows you to solve the problem of convenient transportation access to the entire North-East Region.

GENERAL INDICATORS OF THE NORTHUMBERLAND – TYNE & WEAR – DURHAM METRO:

The total length of new lines – 138.810 km / 85.25 miles.

The total number of new stations – 57.

The average distance between stations – 1.633 km / 1.01 miles.

The maximum distance between stations – 4.535 km / 2.82 miles.

The shortest distance between stations – 0.475 km / 0.30 miles (the original Station “Best View” at the New Bridge).

The total number of stations after the Eighth stage of Development – 117 (*before the First stage of Development – 60*).

The average distance between stations – 1.491 km / 0.92 miles (*before the First stage of Development – 1.359 km / 0.84 miles*).

The total number of developed operating stations – 24.

The number of interchange nodes – 40:

- at new stations – 18;
- at developed operating stations – 22.

Indicated implementation period is 15 years (10 km / 6.2 miles per year).

The scheme of the Northumberland – Tyne & Wear – Durham Metro network is demonstrated on the Figure 17.

3.3 The Determination of the optimal Fare system in the Metro

The existing Tyne and Wear Metro system uses the Zone-Time-based fare collection system [449; 450]. Passengers are several types of payment for transport services [451]:

- “Bridge Card” (Valid on: Bus, Ferry and Metro). *Nexus, in partnership with bus operators and the 5 local authorities in Tyne and Wear are introducing the Bridge Card to anyone who may need additional support whilst traveling.*

- "Magpie Mover" (Valid on: Bus, Ferry and Metro). However you get to and from Newcastle United home games, only one travel ticket is valid on most buses, Metro, train and ferry - the Magpie Mover Ticket from Network One, exclusively for Newcastle United season ticket holders.
- "Metro single fares" (Valid on: Ferry, Metro and Rail). Single tickets are valid on Metro, Shields Ferry and on the train between Newcastle and Sunderland.
- "Rail single and return fares" (Valid on: Metro and Rail). The single adult rail fare for journeys on Northern Rail services between Newcastle and Sunderland is £2.60.
- "Adult day tickets" (Valid on: Bus, Ferry, Metro and Rail). If you are making more than a single or return journey in one day, using bus and Metro, or buses run by different operators, save money with a day ticket or Transfare.
- "Metro day tickets" (Valid on: Ferry, Metro and Rail). DaySaver tickets allow unlimited travel on various forms of transport. Travel times and prices vary depending on the type of DaySaver.
- "Family/group day tickets" (Valid on: Bus, Ferry, Metro and Rail). Explorer North East family ticket is valid for a family of two adults and up to three children (under 14) for a whole day's unlimited travel in Tyne and Wear and beyond.
- "Season tickets" (Valid on: Bus, Ferry, Metro and Rail). If you're traveling regularly on Metro and bus, or using buses run by different operators, save money with a Network One Travel Ticket.
- "Metro season tickets" (Valid on: Ferry, Metro and Rail). If you commute or travel on Metro regularly then the MetroSaver, Corporate MetroSaver season ticket or Metro Class Travel pass may be for you.
- "Child day tickets" (Valid on: Bus, Ferry, Metro and Rail). Young people who have an Under 16 Card can travel on public transport in Tyne and Wear for just £1 a day by buying a CAT (Child All-day Ticket).
- "Metro child fare" (Valid on: Metro). Children under the age of five travel free on Metro. Under 16 year olds with an Under 16 Card can travel on the concessionary child fare. Children without an Under 16 Card can travel for the commercial child fare.
- "Child season ticket" (Valid on: Bus, Ferry, Metro and Rail). School Passes allow you to pay for school journeys in advance so there is no need to find change for fares every day.
- "Metro concessionary fare" (Valid on: Ferry, Metro and Rail). Travel for free on Metro with a Metro Gold Card.
- "Metro student season tickets" (Valid on: Ferry, Metro and Rail). 16-18 Metro Student Cards and Metro Student Cards allow unlimited weekly or monthly travel on Metro, Shields Ferry and local rail services.
- "Student season tickets" (Valid on: Bus, Ferry, Metro and Rail). Full-time students aged 16 and over can save loads of money with a Network One Student Ticket.
- "New Deal season tickets" (Valid on: Bus, Ferry, Metro and Rail). If you're in the Government's New Deal Programme you can buy a discounted Network Travelticket when you show your ID card (supplied by the Employment Service).

For example: there are three Metro zones (A-B-C), which was indicated earlier. Four types of time-based charging – "Single / Monday - Sunday / All Day", "Day Saver / Monday - Friday / Before 09:00", "Day Saver / Monday - Friday / After 09:00", "Day Saver / Weekends and Bank Holidays / All day". Price of travel:

- One Zone: £ 1.50 (Single / Monday - Sunday / All Day); £ 2.50 (Day Saver / Monday - Friday / Before 09:00); £ 2.10 (Day Saver / Monday - Friday / After 09:00); £ 2.10 (Day Saver / Weekends and Bank Holidays / All day).

- Two zones: £ 2.30 (Single / Monday - Sunday / All Day); £ 3.70 (Day Saver / Monday - Friday / Before 09:00); £ 3.10 (Day Saver / Monday - Friday / After 09:00); £ 3.10 (Day Saver / Weekends and Bank Holidays / All day).
- All zones: £ 3.00 (Single / Monday - Sunday / All Day); £ 4.80 (Day Saver / Monday - Friday / Before 09:00); £ 4.00 (Day Saver / Monday - Friday / After 09:00); £ 4.00 (Day Saver / Weekends and Bank Holidays / All day).

There is a limit on the time of ticket purchase: "Single ticket. They are valid for 90 minutes from when you buy one and you can use them for one continuous journey on the Metro and on the train between Newcastle and Sunderland. The price depends on the number of zones you travel" [451]).

Network One Travel Tickets [453]: Anytime Ticket (*One Week, Four Weeks, Annual*); Student Ticket (*One Week, Four Weeks, Termly*); Day Rover Ticket (*Day Rover, Junior Rover*); Magpie Mover Ticket (*Season*); New Deal Ticket (*One Week, Four Weeks*); Explorer North East Ticket (*Adult, Concessions, Child, Family Ticket*). Position of zones shown in the Figure 75 [454].

In the Developed network of Metro may use **the Zone System of Fare as the Development of Existing Zoning.**

THE ZONE-1 (14 stations): Gateshead, Gateshead Stadium, Felling, Mount Pleasant, Central Station, Monument, Saint James, Manors, Byker, Chillingham Road, Haymarket, Jesmond, West Jesmond, Ilford Road.

THE ZONE-2 (35 stations): Northumberland Park, Palmersville, Benton, Four Lane Ends, Killingworth, Longbenton, South Gosforth, Regent Centre, Wansbeck Road, Fawdon, Kingston Park, Bank Foot, Kenton, Callerton Parkway, Westerhope, Denton Burn, Benwell, Walkergate, Wallsend, Hadrian Road, Howdon, Walker, Simonside, Bede, Jarrow, Hebburn, Fellgate, Pelaw, Heworth, Bensham, The Metro Centre, Blaydon, Whickham, Low Fell, Leam Lane.

THE ZONE-3 (28 stations): Percy Main, West Monkseaton, Shiremoor, Seaton Delaval, South Cramlington, Wideopen, Dinnington, Airport, Throckley, Crawcrook, Ryton, Rowlands Gill, Burnopfield, Stanley, Kibblesworth, Ouston, Chester-le-Street, Birtley, Rickleton, Glebe, Fatfield, Shiney Row, Newbottle, Houghton-le-Spring, South Hylton, Downhill, Brockley Whins, Tyne Dock.

THE ZONE-4 (25 stations): Monkseaton, Whitley Bay, Cullercoats, Tynemouth, North Shields, Meadow Well, Billy Mill, Port, Best View, South Shields, Chichester, Harton, East Boldon, Cleadon, Seaburn, Stadium of Light, Saint Peter's, Sunderland, Park Lane, University, Millfield, Pallion, Springwell, Hillview, New Silksworth.

THE ZONE-5: (15 stations) Blyth, Cramlington, Ponteland, Heddon-on-the-Wall, Prudhoe, Consett, Annfield Plain, East Durham, Durham, Pity Me, Peterlee, Easington Colliery, Murton, Hetton-le-Hole, Seaham.

The scheme of the Tyne & Wear Metro Developed network Fare zoning is demonstrated on the Figure 18.

BUT IN OPERATION EXTENSIVE NETWORK OF TYNE AND WEAR METRO WITH THE RING-RADIAL SCHEME PATTERN CONSERVATION ZONE-TIME-BASED FARE COLLECTION SYSTEM IS IMPRACTICAL.

Firstly, set of ring, ring-radial and radial routes in the presence of multiple interchanging nodes complicated zoning. The complex zoning of inconvenience for passengers and personnel of the Metro:

- Confusion in determining the cost of travel in a few areas;
- In the growth of many types of tickets;
- Significantly more complex control is correct fare at the exit of the metro station;
- When necessary to change the route the passenger is unable to pay the fare, which

leads to a formal violation of the rules of a passenger fare to travel.

Secondly, the presence of route length of over 16.09 km / 10.00 miles complicates the calculation of time spent in transit when the trip is made in the period from 8.45 AM – till 9.15 AM. By purchasing a ticket type “Day Saver / Monday - Friday / Before 09:00” or “Day Saver / Monday - Friday / After 09:00”, the passenger is unable to change during the trip. If you have any technical or organizational delays when traveling, waiting for a train on the platform, transfer from one train to another having psychological problems (trip fully paid at a higher price: the beginning of a trip paid for at a price of “Before 09:00”, and the actual completion is price “After 09:00”). Similarly, the time change and travel with “Before 09:00” to “After 09:00” requires the purchase of another ticket.

To develop a network of Tyne and Wear Metro is optimal transition from zone-time payment to get to the same price, regardless of trip distance and travel time. This ensures the delivery of a passenger from any station to any station at any time of day and night.

As a single price is advisable to apply the value of £ 2.00. This value is reasonable for the following reasons.

Firstly, the passenger need not rely on entering the fare, which provides psychological comfort.

Secondly, the price of £ 2 is close to the average ticket price all zones: $(£ 1.50 + £ 3.00):2 = £ 2.25$.

Thirdly, the price increase for the first zone and a decrease in prices for the second and third zone does not reduce the total income from ticket sales. Ease of use ensures revenue growth due to the increased attractiveness of the underground, because the level of comfort and speed of movement of the subway is more convenient for the transfer with the route on the route is no need to pay for further travel.

Fourthly, the price can be applied as a token to pass through the turnstile coin “£2” (Given the possible increase in fares for the planned project for 15 years – eight stages of development – two coins “£2”).

Fifthly, use as a token in the turnstile coin “£2” (or, potentially, two coins for “£2”) accelerates the passage of passengers through the anteroom (this is important in providing patrol a large number of participants in events at stadiums and concerts, shopping centers and in places of public entertainment).

Sixthly, the transition to the Coin payment of the entrance (1 for “£2” or 2 for “£2”) provides significant cost savings due to not having to print a paper ticket.

Seventhly, for the convenience of passengers simplified system of exchange of coins and banknotes.

Eighthly, reduced cost of travel, as a simplified system of exchange of coins and bills provided less intelligent machines that have less value and require a less complex service system.

Ninthly, much simpler and cheaper system of entry control passengers.

Tenthly, the need to monitor fare payment at the exit of passengers is eliminated.

Eleventhly, there is no need to restrict the use of single ticket time (90 minutes). Most of the passengers travel on a particular route. The number of “metro-tourists”, which riding the Metro three or four hours, is minimal.

If necessary, documentary evidence of travel on the Metro to the financial or legal accountability (not more than 1% of passengers) can be printed from the existing surveillance cameras data in places of entry and exit of the Metro and landing, the entering the train with time.

The use of the Coin system of payment of travel does not exclude the presence of a developed system of “Only Metro” or “All Conurbation Transport” multiple, daily, weekly, monthly,

seasonal and annual tickets. Passengers with these electronic tickets get to the station through the turnstiles, or the common portals of the Barrier-free environment system.

The use of paper-based tickets [455] isn't cost effective. If you count the cost of a paper ticket – paper, cut edges, paint, magnetic tape, double-sided printing – is then 8 or 9 pence. The average passenger volume is 42 million passengers in the year; approximately 30 - 35% buys single tickets (the remaining reusable tickets); the production of 14 million tickets spent 1.2 million pounds annually. With increasing of passenger traffic the cost will increase.

SINGLE TICKET PRICES COMBINED WITH THE COIN OR TOKEN SYSTEM OF PAYMENT FOR COST-EFFECTIVE.

Conclusions of the Third chapter

Held in the Second chapter analysis led to the following conclusions:

1. Public transport system of the Conurbation should develop and improve.
2. The network of Bus services has reached its limit and compaction has potential for further development.
3. The development potential based on Metro commuter rail has been exhausted.
4. In modern conditions it is optimal to create a system of high-speed off-street public transport on the basis of the reconstruction and development of the Metro.
5. The development of Metro in the form of "Light rail" land-lines impractical because of the features of Conurbation urban planning. The optimal direction of development is the creation of mainly underground Metro system.
6. Town-planning features of Conurbation associated with the location of the main points of integration with external transportation, accommodation, residential areas, community centers, places of work and leisure determine the feasibility of forming the developed Ring-Radial network of the Metro.
7. World experience proves the optimality of subways radial-ring circuit in conurbations with like the Tyne and Wear Conurbation layout.
8. The proposed system consists of: a peripheral Ring line passing through the Airport, the Seaport and railway stations, a few radial lines connecting the major settlements in the southern part of Tyne and Wear, Durham and Northumberland with the central part.
9. Implementation of the proposed scheme is appropriate in several stages. The Basic version – its eight stages. The Alternative version – its three stages.
10. The final part of the development – the reconstruction of the existing surface Metro lines to transfer them to an underground location.
11. In the formation of a developed network of preserving the existing Metro band scheme for determining the price of travel is impractical. Fare system with a paper ticket is not economically sensible.
12. Optimal system of fare payment in the extensive network of Metro is coin-or token system. Directions single price for any distance.
13. Such a system works effectively in many subways around the World. This system is economically viable, convenient for passengers and is part of measures to protect the environment.

The Chapter 4

THE ROUTE NETWORK OF THE TYNE AND WEAR CONURBATION METRO

4.1 The Route set of the Metro

In World practice metros with Ring-Radial scheme the train with passengers runs only on one line. There are technological maneuver trains from one line to another without passengers. The movement of the train with passengers from the line to line is possible in principle, but its practical application – is a rare phenomenon. The motion of the train with passengers on the entire Metro network does not apply.

The proposed scheme of Northumberland – Tyne and Wear – Durham Metro allows combining Ring and Radials lines.

The developed network of the Metro has four overlapping rings, and eight radial branches, that connect to rings and each other in the Central part. This allows for the delivery of passengers from any station to any without stopping. Movement of trains is carried out in one direction. An exception is the line that connects the Blyth, Cramlington, South Cramlington, Killingworth, Four Lane Ends, Walkergate, Walker, Pelaw. To move from this area on the integrated network you must change the direction of the train. This change is made on the detour section or deadlock section after stations Pelaw or Leam Lane.

Work of the integrated Ring-Radial network of Northumberland – Tyne and Wear – Durham Metro is based on a set of several dozens of routes. As a result of the extensive network of Tyne and Wear Metro, forming a Ring-Radial scheme, is a possibility of over a hundred routes. Routes are used in various combinations, depending on time of day, day of week or the season. The existing two (today) or four (in principle) routes of operating Metro system is an integral part of the set of possible routes of the developed Metro network.

Before the beginning of the next stage of the Tyne & Wear Metro Development advisable to amend the official scheme [456; 457].

The scheme of lanes with only “Green lane” and “Yellow lane” is insufficient. Periodic change in color of lines and circuits route is inconvenient for passengers [458; 459; 460; 461].

FOR THE CONVENIENCE OF PASSENGERS, we must refer to the Official Scheme of Metro all operating routes. Such schemes, which are convenient for passengers, were in 1982 – 1985 – 1991 [462; 463]. The position of existing routes in the Developed Metro network is shown in Figure 19.

From the set of possible 56 Main and 9 Additional routes were selected, which are optimal for the smooth operation of Metro. All these routes are for the one-direction movement of trains. The routes are named by approximately configurationally associations.

Results indicated:

- 5 Routes of “THE RING” (R) type;
- 4 Routes of “THE DOUBLE RING” (DR) type;
- 1+6 Routes of “THE GRAND LOOP” (GL) type;
- 3 Routes of “THE DOUBLE LOOP” (DL) type;
- 3+3 Routes of “THE COMPLEX LOOP” (CL) type;
- 7 Routes of “THE BIG LOOP” (BL) type;
- 9 Routes of “THE SMALL LOOP” (SL) type;

OPERATING ROUTES OF THE TYNE AND WEAR METRO AS THE BASIS FOR THE FURTHER DEVELOPMENT

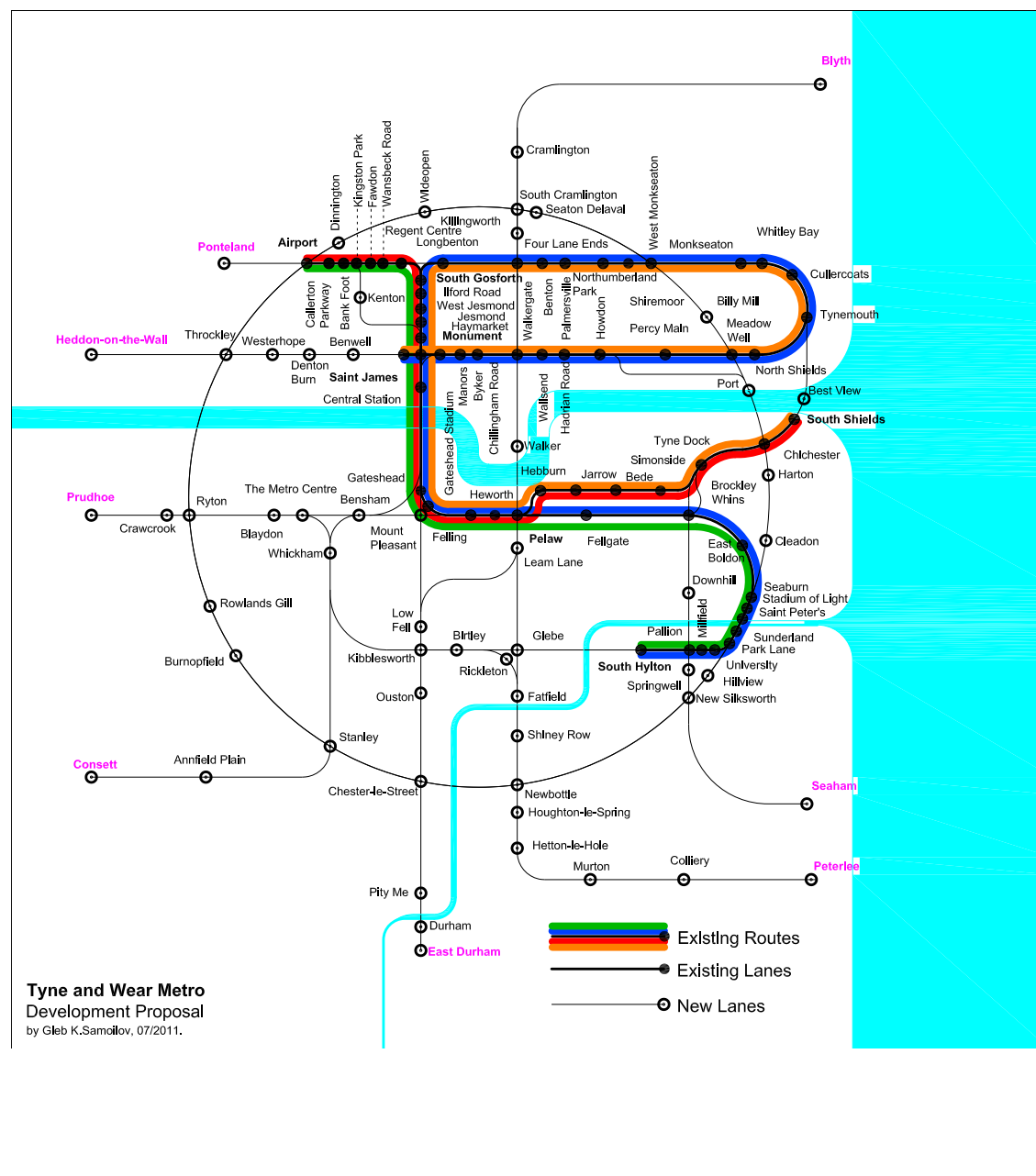


Figure 19.
Operating routes of the Tyne and Wear Metro as the Basis for the further Development.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

- 11 Routes of "THE BIG WAVE" (BW) type;
- 11 Routes of "THE LONG RADIAL WAVE" (LRW) type;
- 2 Routes of "THE SMALL RADIAL WAVE" (SRW) type.

The exists Route "**The Green Line**" (South Hylton, Pallion, Millfield, University, Park Lane, Sunderland, Saint Peter's, Stadium of Light, Seaburn, East Boldon, Brockley Whins, Fellgate, Pelaw, Felling, Gateshead Stadium, Gateshead, Central Station, Monument, Haymarket, Jesmond, West Jesmond, Ilford Road, South Gosforth, Regent Centre, Wansbeck Road, Fawdon, Kingston Park, Bank Foot, Callerton Parkway, Airport) and the exists Route "**The Yellow Line**" (South Shields, Chichester, Tyne Dock, Bede, Jarrow, Hebburn, Pelaw, Felling, Gateshead Stadium, Gateshead, Central Station, Monument, Haymarket, Jesmond, West Jesmond, Ilford Road, South Gosforth, Longbenton, Four Lane Ends, Benton, Palmersville, Shiremoor, West Monkseaton, Monkseaton, Whitley Bay, Cullercoats, Tynemouth, North Shields, Meadow Well, Percy Main, Howdon, Hadrian Road, Wallsend, Walkergate, Chillingham Road, Byker, Manors, Monument, Saint James) is fully or partially included in most of New routes.

They are the basis for the formation of new routes, which will appear as the implementation of the First, Second, Third, Fourth, Fifth, Sixth, Seventh and Eighth stages of the Development.

5 Routes of "THE RING" (R) type.

The Route "THE GRAND RING" (GR): *AIRPORT – THROCKLEY – RYTON – STANLEY – CHESTER-LE-STREET – NEWBOTTLE – NEW SILKSWORTH – PARK LANE – SEABURN – CHICHESTER – PORT – MEADOW WELL – WEST MONK SEATON – SOUTH CRAMLINGTON – AIRPORT *.

This Route has 26 stations (14 interchange nodes): Sunderland (the Initial station / the Final station – conditionally), Saint Peter's, Stadium of Light, Seaburn (the Interchange node), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange node), Meadow Well (the Interchange node), Billy Mill, West Monkseaton (the Interchange node), Seaton Delaval, South Cramlington (the Interchange node), Wideopen, Dinnington, Airport (the Interchange node), Throckley (the Interchange node), Ryton (the Interchange node), Rowlands Gill, Burnopfield, Stanley (the Interchange node), Chester-le-Street (the Interchange node), Newbottle (the Interchange node), New Silksworth (the Interchange node), Hillview, Park Lane (the Interchange node), Sunderland (the Initial station / the Final station – conditionally). The scheme of "The Grand Ring" Route (GR) is demonstrated on the Figure 20.

The Route "THE NORTH TYNESIDE RING" (NTsR): *TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – FELLING – PELAW – TYNE DOCK – CHICHESTER – BEST VIEW – TYNEMOUTH*.

This Route has 31 stations (12 interchange nodes): South Shields (the Initial station / the Final station – conditionally), Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Gateshead Stadium, Felling (the Interchange node), Heworth, Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields (the Initial station / the Final station – conditionally). The scheme of "The North Tyneside Ring" Route (NTsR) is demonstrated on the Figure 21.

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE GRAND RING” – GR

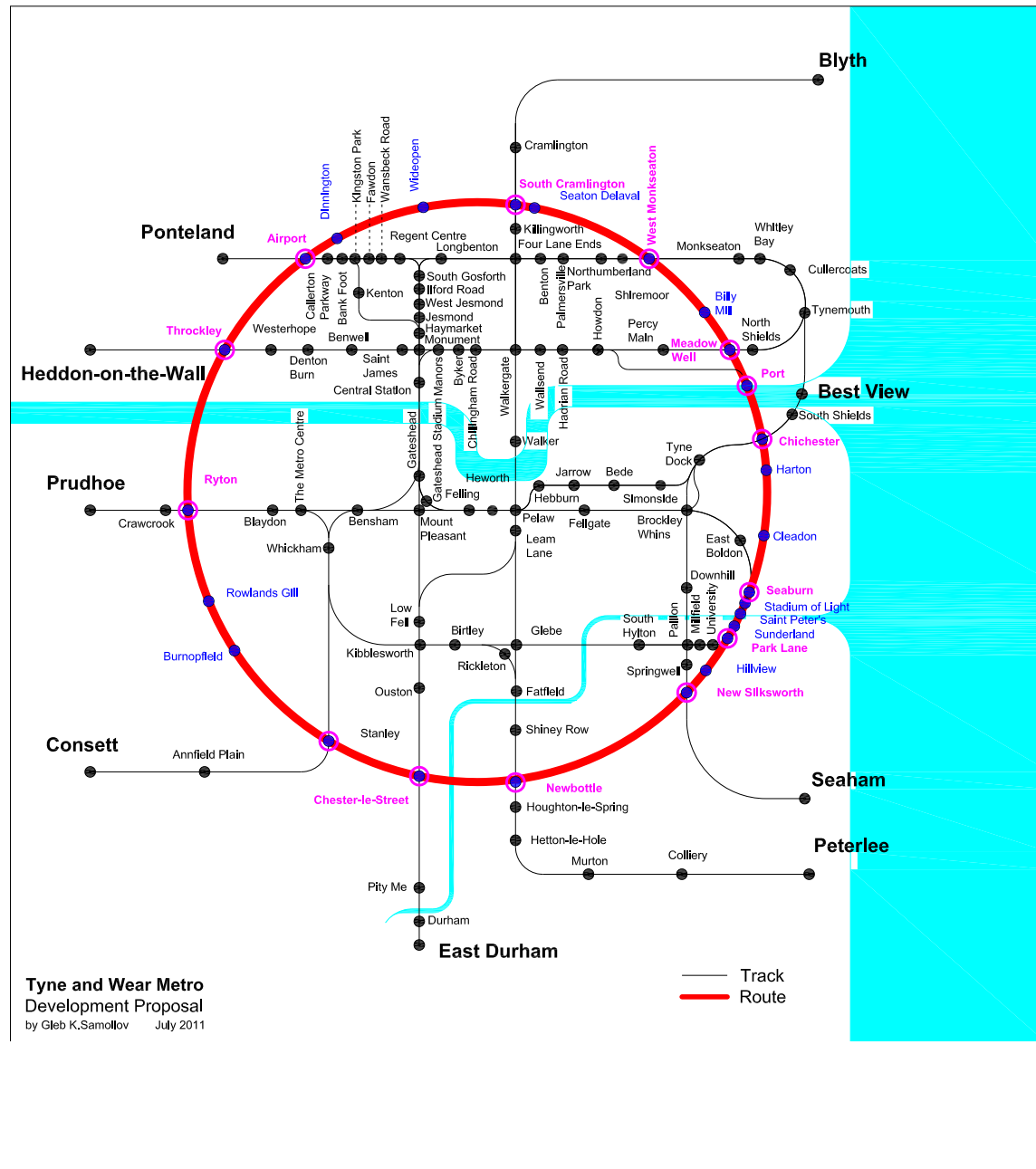


Figure 20.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE GRAND RING” – GR.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

The Route “THE SOUTH TYNESIDE RING” (STsR): *PORT – CHICHESTER – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – PORT*.

This Route has 26 stations (14 interchange nodes): Central Station (the Interchange node: the Initial station / the Final station – conditionally), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Port (the Interchange node), Chichester (the Interchange node), Harton, Cleadon, Seaburn (the Interchange node), Stadium of Light, Saint Peter’s, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node: the Initial station / the Final station – conditionally). The scheme of “The South Tyneside Ring” Route (STsR) is demonstrated on the Figure 22.

The Route “THE SMALL RING” (SR): *GLEBE – PALLION – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – MOUNT PLEASANT – BENSAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE*.

This Route has 21 stations (11 interchange nodes): Pelaw (the Interchange node: the Initial station / the Final station – conditionally), Fellgate, Brockley Whins (the Interchange node), East Boldon, Seaburn (the Interchange node), Stadium of Light, Saint Peter’s, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Heworth, Pelaw (the Interchange node: the Initial station / the Final station – conditionally). The scheme of “The Small Ring” Route (SR) is demonstrated on the Figure 23.

The Route “THE COMPLEX RING” (CR): *GLEBE –PALLION – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE*.

This Route has 51 stations (26 interchange nodes): Glebe (the Interchange node: the Initial station / the Final station – conditionally), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter’s, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Percy Main, Meadow Well (the Interchange node), North Shields, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node: the Initial station / the Final station – conditionally). The scheme of “The Complex Ring” Route (CR) is demonstrated on the Figure 24.

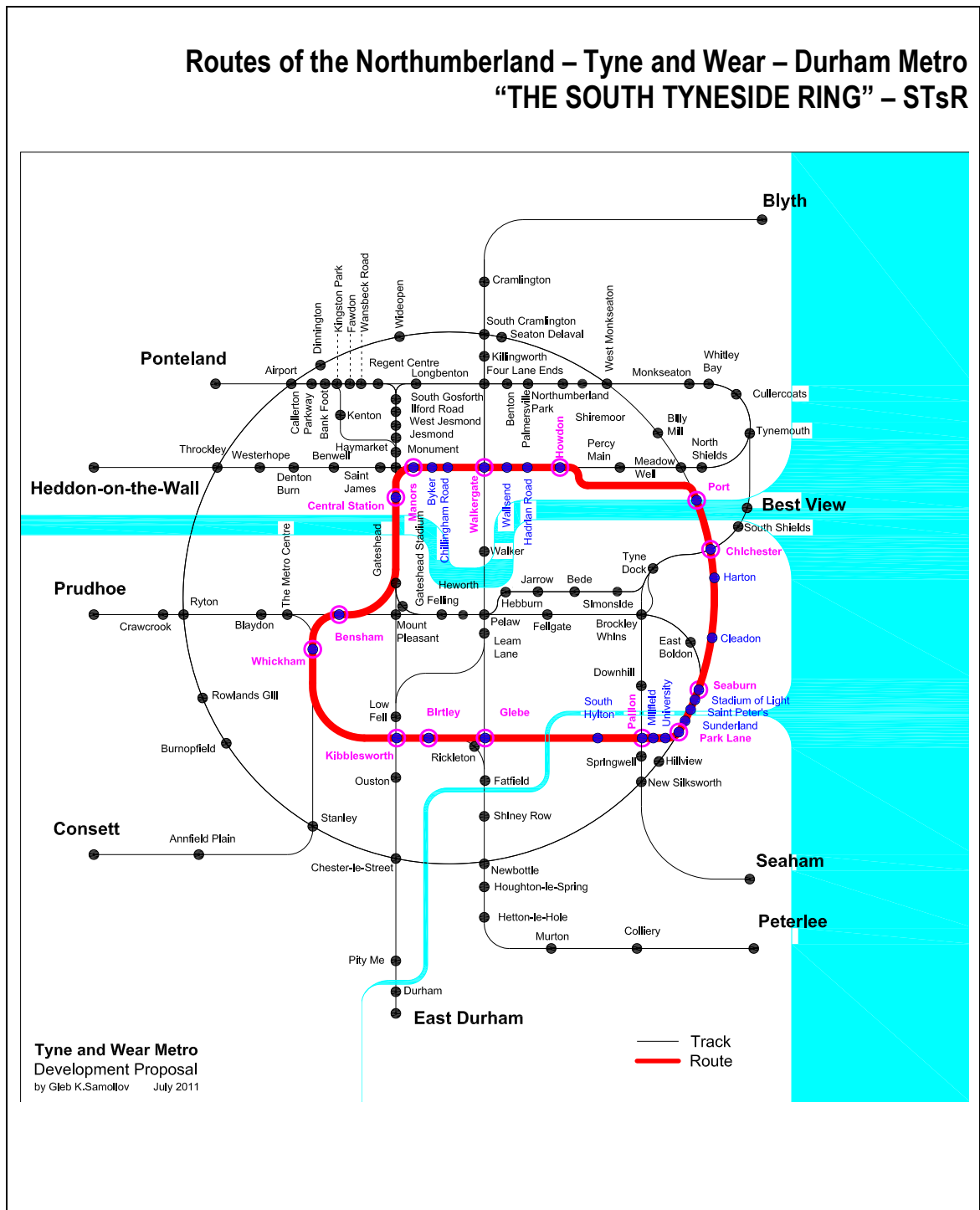


Figure 22.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SOUTH TYNESIDE RING” – STsR.

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).

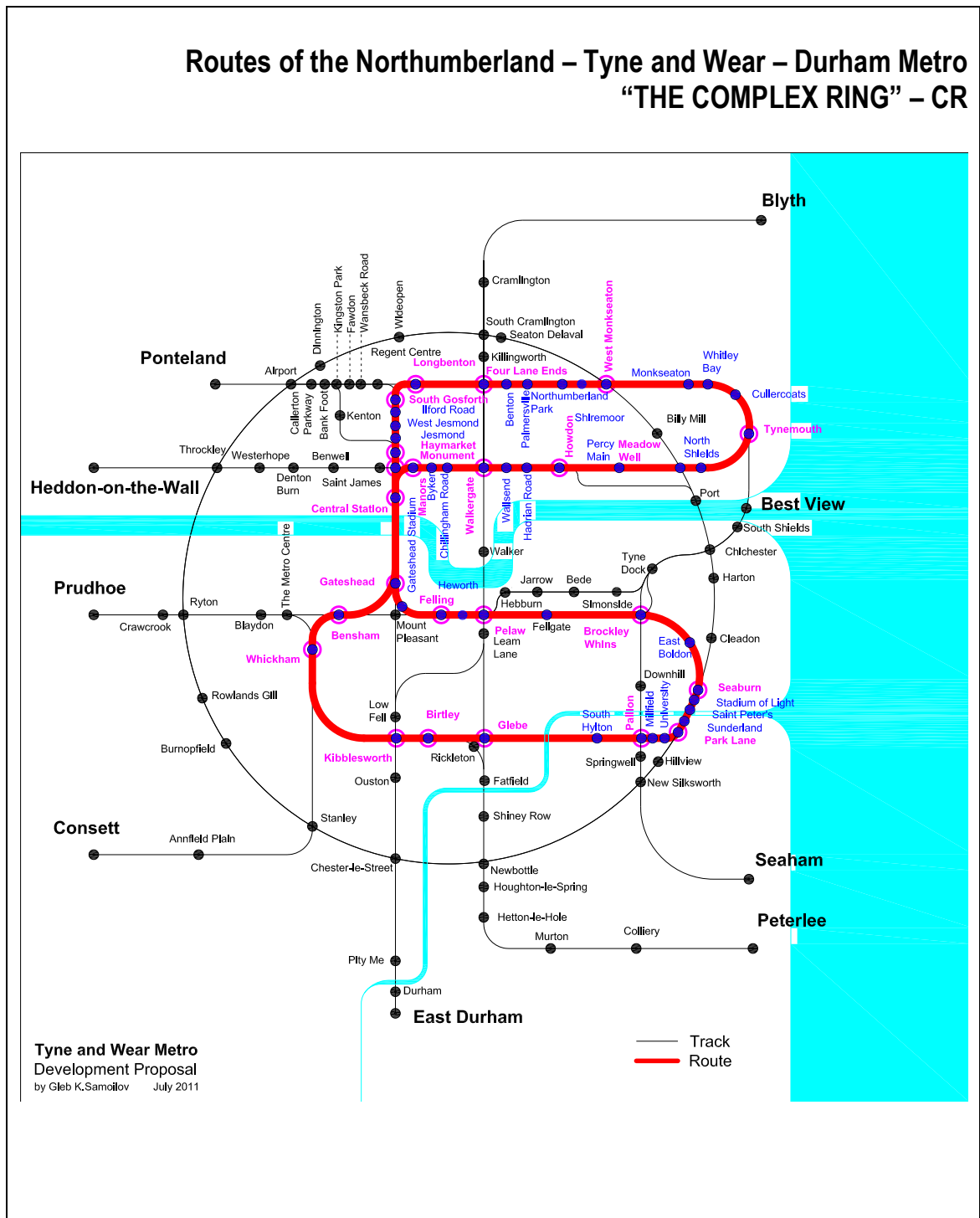


Figure 24.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE COMPLEX RING” – CR.

*Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).*

4 Routes of "THE DOUBLE RING" (DR) type.

The Route "THE DOUBLE RING -1" (DR-1): *SEABURN – CHICHESTER – PORT – MEADOW WELL – WEST MONKSEATON – SOUTH CRAMLINGTON – AIRPORT – THROCKLEY – RYTON – STANLEY – CHESTER-LE-STREET – NEWBOTTLE – NEW SILKSWORTH – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSHAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN*.

This Route has 77 stations (40 interchange nodes): Seaburn (the Interchange node: the Initial station / the Final station – conditionally), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Percy Main, Meadow Well (the Interchange node), North Shields, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange node), Meadow Well (the Interchange node), Billy Mill, West Monkseaton (the Interchange node), Seaton Delaval, South Cramlington (the Interchange node), Wideopen, Dinnington, Airport (the Interchange node), Throckley (the Interchange node), Ryton (the Interchange node), Rowlands Gill, Burnopfield, Stanley (the Interchange node), Chester-le-Street (the Interchange node), Newbottle (the Interchange node), New Silksworth (the Interchange node), Hillview, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node: the Initial station / the Final station – conditionally). The scheme of "The Double Ring -1" Route (DR-1) is demonstrated on the Figure 25.

The Route "THE DOUBLE RING -2" (DR-2): *PARK LANE – SEABURN – CHICHESTER – PORT – MEADOW WELL – WEST MONKSEATON – SOUTH CRAMLINGTON – AIRPORT – THROCKLEY – RYTON – STANLEY – CHESTER-LE-STREET – NEWBOTTLE – NEW SILKSWORTH – PARK LANE – SEABURN – CHICHESTER – PORT – HOWDON – WALKERGATE – MANORS – CENTRAL STATION – BENSHAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE*.

This Route has 52 stations (28 interchange nodes): Seaburn (the Interchange node: the Initial station / the Final station – conditionally), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange node), Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange

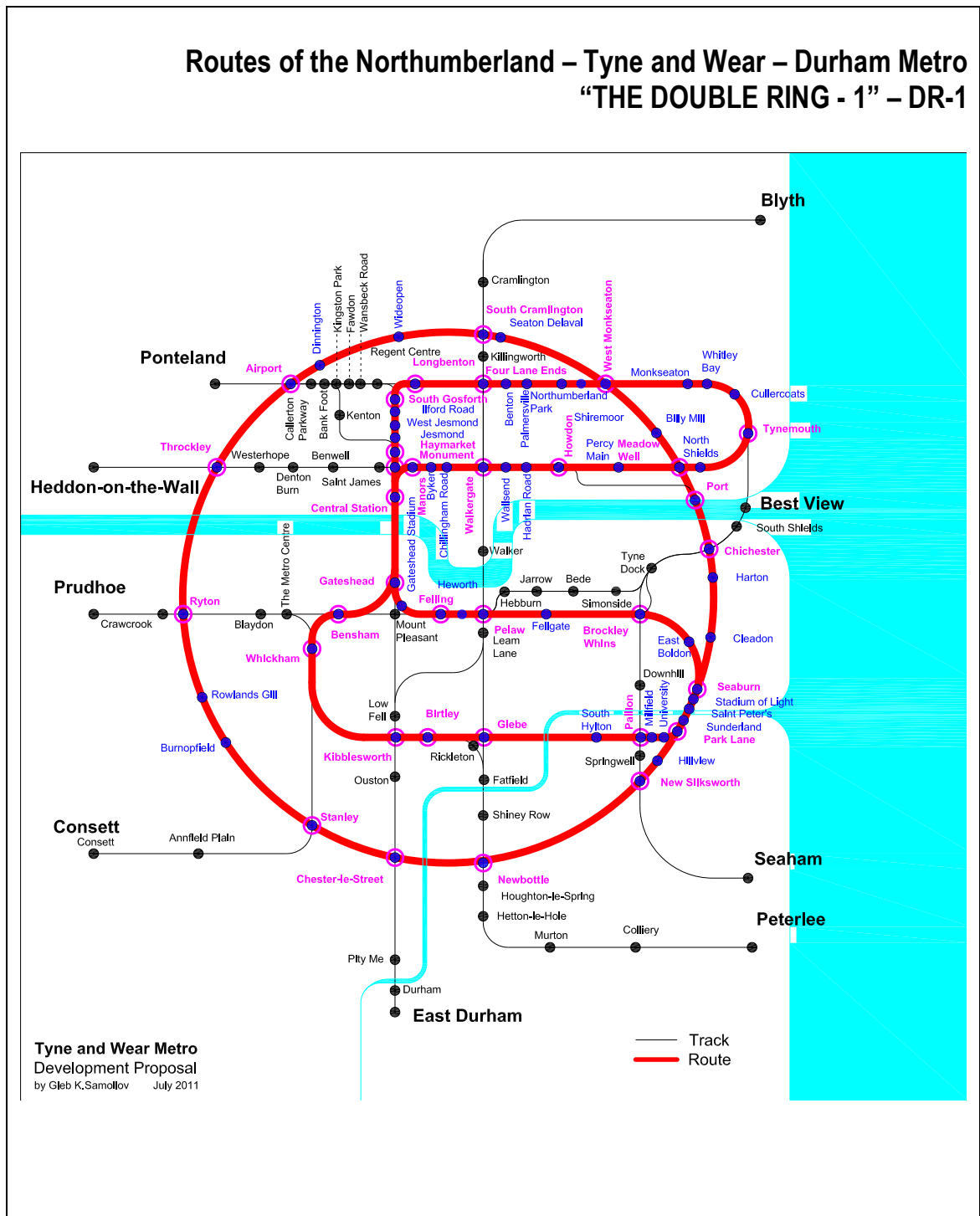


Figure 25.
 Routes of the Northumberland – Tyne and Wear – Durham Metro
 “THE DOUBLE RING - 1” – DR-1.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE DOUBLE RING - 2” – DR-2

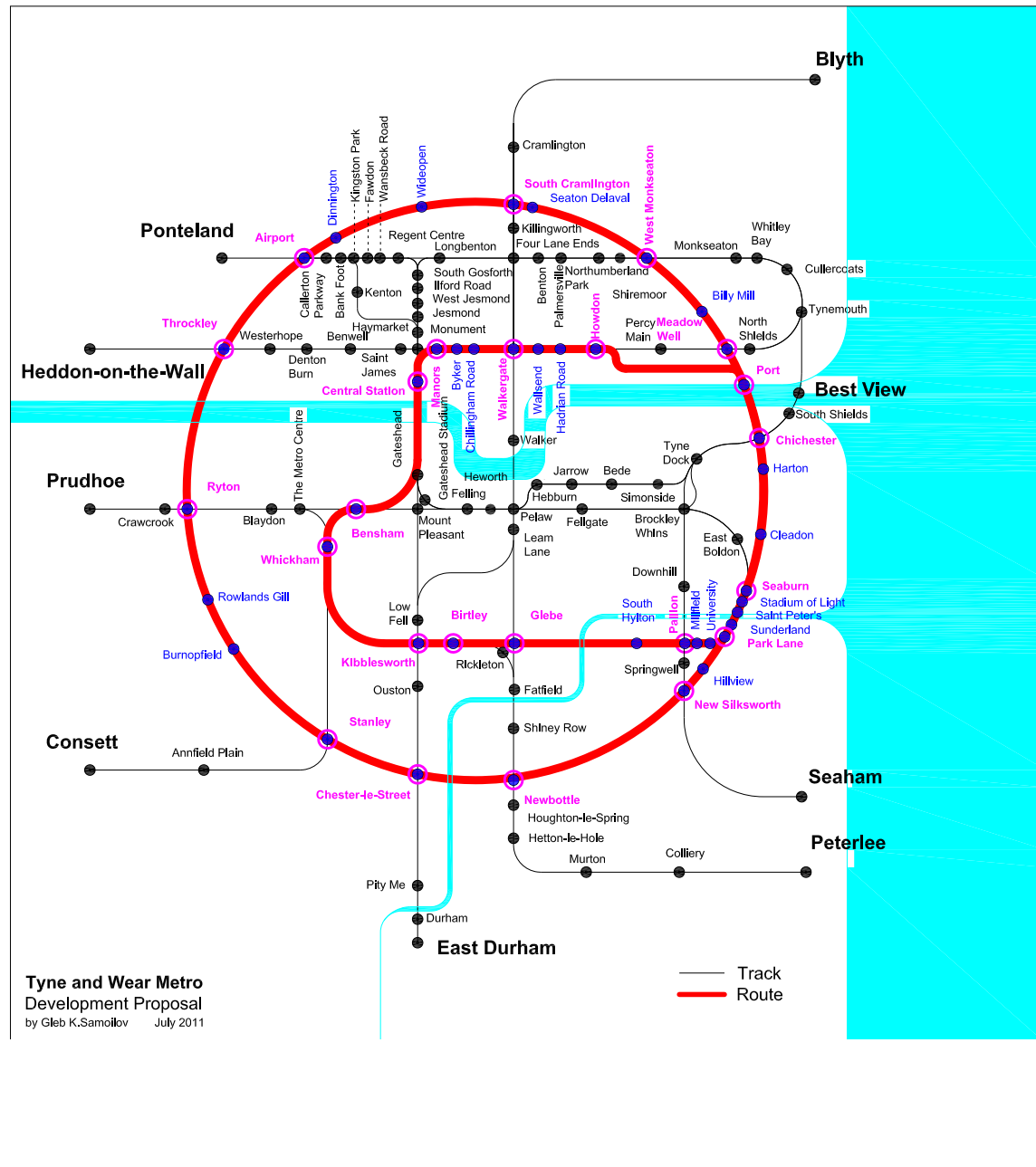


Figure 26.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE DOUBLE RING - 2” – DR-2.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

node), Meadow Well (the Interchange node), Billy Mill, West Monkseaton (the Interchange node), Seaton Delaval, South Cramlington (the Interchange node), Wideopen, Dinnington, Airport (the Interchange node), Throckley (the Interchange node), Ryton (the Interchange node), Rowlands Gill, Burnopfield, Stanley (the Interchange node), Chester-le-Street (the Interchange node), Newbottle (the Interchange node), New Silksworth (the Interchange node), Hillview, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node: the Initial station / the Final station – conditionally). The scheme of “The Double Ring -2” Route (DR-2) is demonstrated on the Figure 26.

The Route “THE DOUBLE RING -3” (DR-3): *SEABURN – CHICHESTER – PORT – MEADOW WELL – WEST MONKSEATON – SOUTH CRAMLINGTON – AIRPORT – THROCKLEY – RYTON – STANLEY – CHESTER-LE-STREET – NEWBOTTLE – NEW SILKSWORTH – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – MOUNT PLEASANT – BENSHAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN*.

This Route has 47 stations (25 interchange nodes): Sunderland (the Initial station / the Final station – conditionally), Saint Peter's, Stadium of Light, Seaburn (the Interchange node), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange node), Meadow Well (the Interchange node), Billy Mill, West Monkseaton (the Interchange node), Seaton Delaval, South Cramlington (the Interchange node), Wideopen, Dinnington, Airport (the Interchange node), Throckley (the Interchange node), Ryton (the Interchange node), Rowlands Gill, Burnopfield, Stanley (the Interchange node), Chester-le-Street (the Interchange node), Newbottle (the Interchange node), New Silksworth (the Interchange node), Hillview, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Mount Pleasant (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland (the Initial station / the Final station – conditionally). The scheme of “The Double Ring -3” Route (DR-3) is demonstrated on the Figure 27.

The Route “THE DOUBLE RING -4” (DR-4): *PELAW – TYNE DOCK – CHICHESTER – BEST VIEW – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – FELLING – PELAW – BROCKLEY WHINS – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – MOUNT PLEASANT – FELLING – HEWORTH – PELAW*.

This Route has 52 stations (23 interchange nodes): Pelaw (the Interchange node: the Initial station / the Final station – conditionally), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Gateshead Stadium, Felling (the Interchange node), Heworth, Pelaw (the Interchange node), Fellgate, Brockley Whins (the Interchange node), East Boldon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE DOUBLE RING - 3” – DR-3

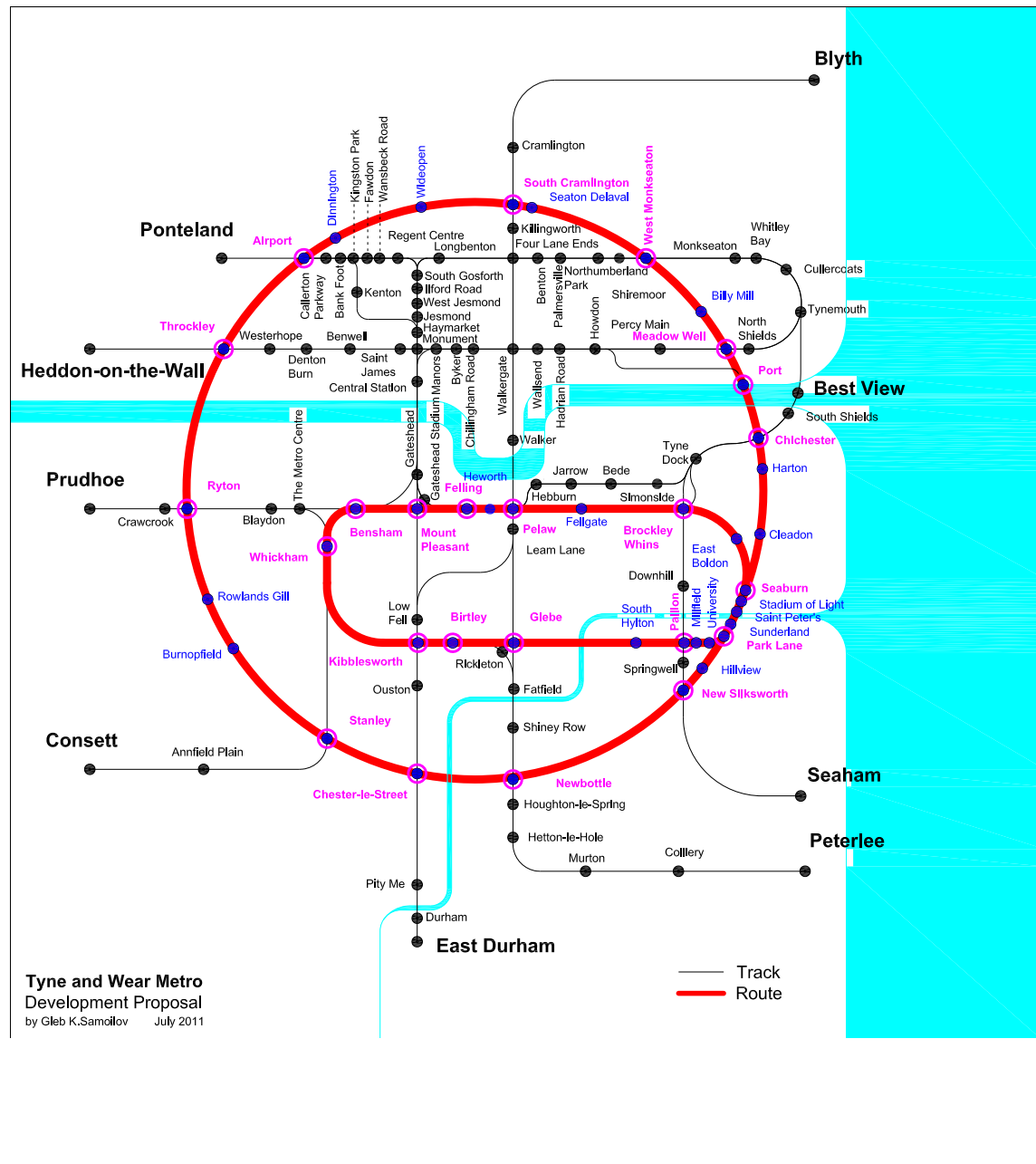


Figure 27.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE DOUBLE RING - 3” – DR-3.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

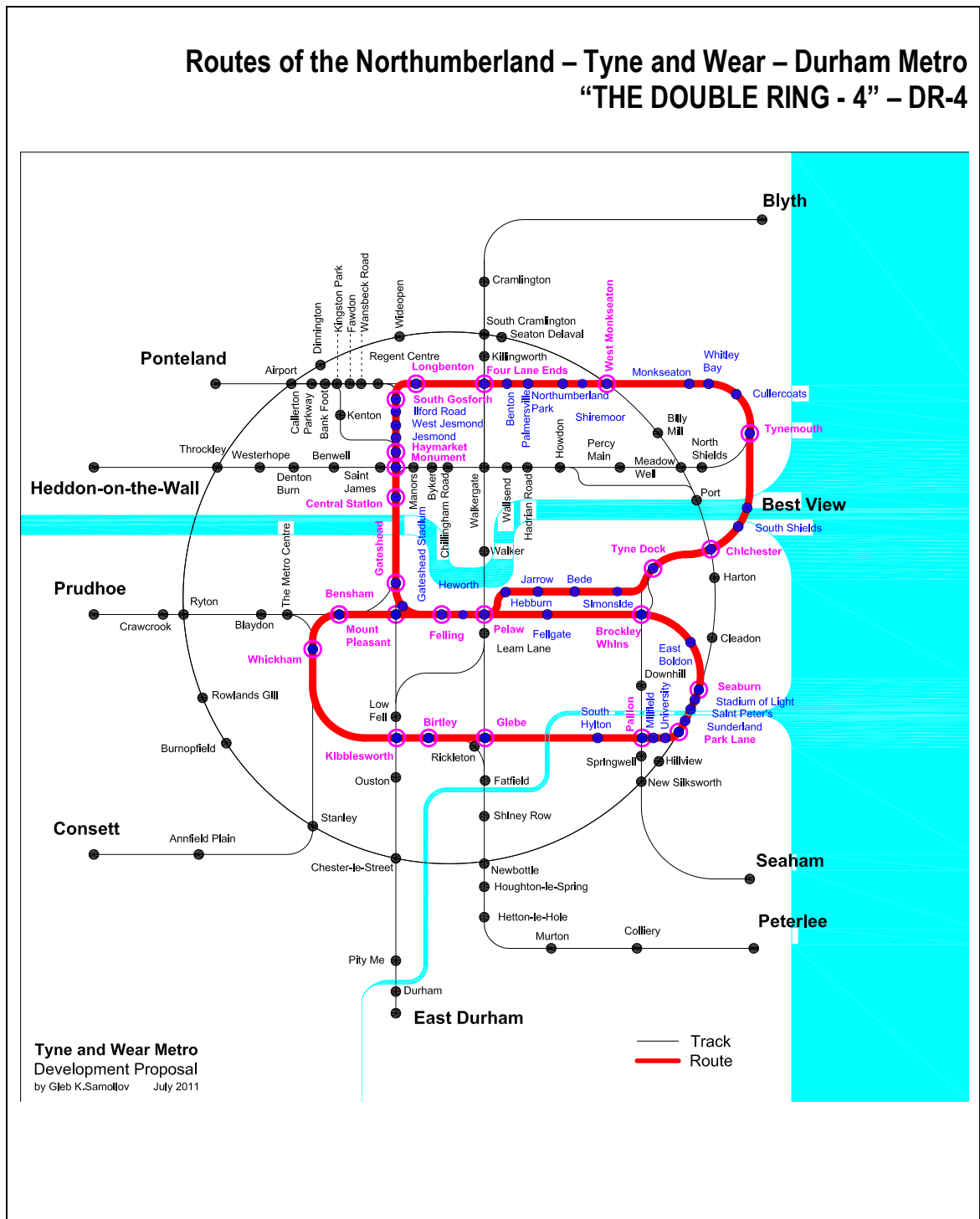


Figure 28.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE DOUBLE RING - 4” – DR-4.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Heworth, Pelaw (the Interchange node: the Initial station / the Final station – conditionally). The scheme of “The Double Ring -4” Route (DR-4) is demonstrated on the Figure 28.

9 Routes of “THE SMALL LOOP” (SL) type.

The Route “THE SMALL LOOP -1” (SL-1): *PRUDHOE – RYTON – BLAYDON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – MOUNT PLEASANT – BENSHAM – THE METRO CENTRE – RYTON – PRUDHOE*.

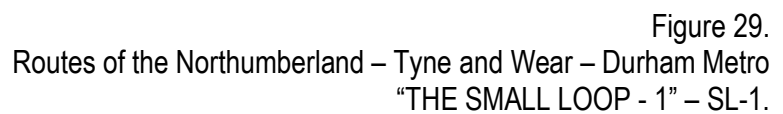
This Route has 31 stations (16 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter’s, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Mount Pleasant (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Small Loop” Route (SL-1) is demonstrated on the Figure 29.

The Route “THE SMALL LOOP -2” (SL-2): *PONTELAND – AIRPORT – BANK FOOT – KENTON – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – FELLING – PELAW – BROCKLEY WHINS – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 38 stations (22 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kenton, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter’s, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Kenton, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -2” Route (SL-2) is demonstrated on the Figure 30.

The Route “THE SMALL LOOP -3” (SL-3): *HEDDON-ON-THE-WALL – THROCKLEY – SAINT JAMES – MONUMENT – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – FELLING – PELAW – TYNE DOCK – CHICHESTER*.

This Route has 46 stations (18 interchange nodes): Chichester (the Interchange node – the Initial station / the Final station – conditionally), Tyne Dock (the Interchange node),



Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

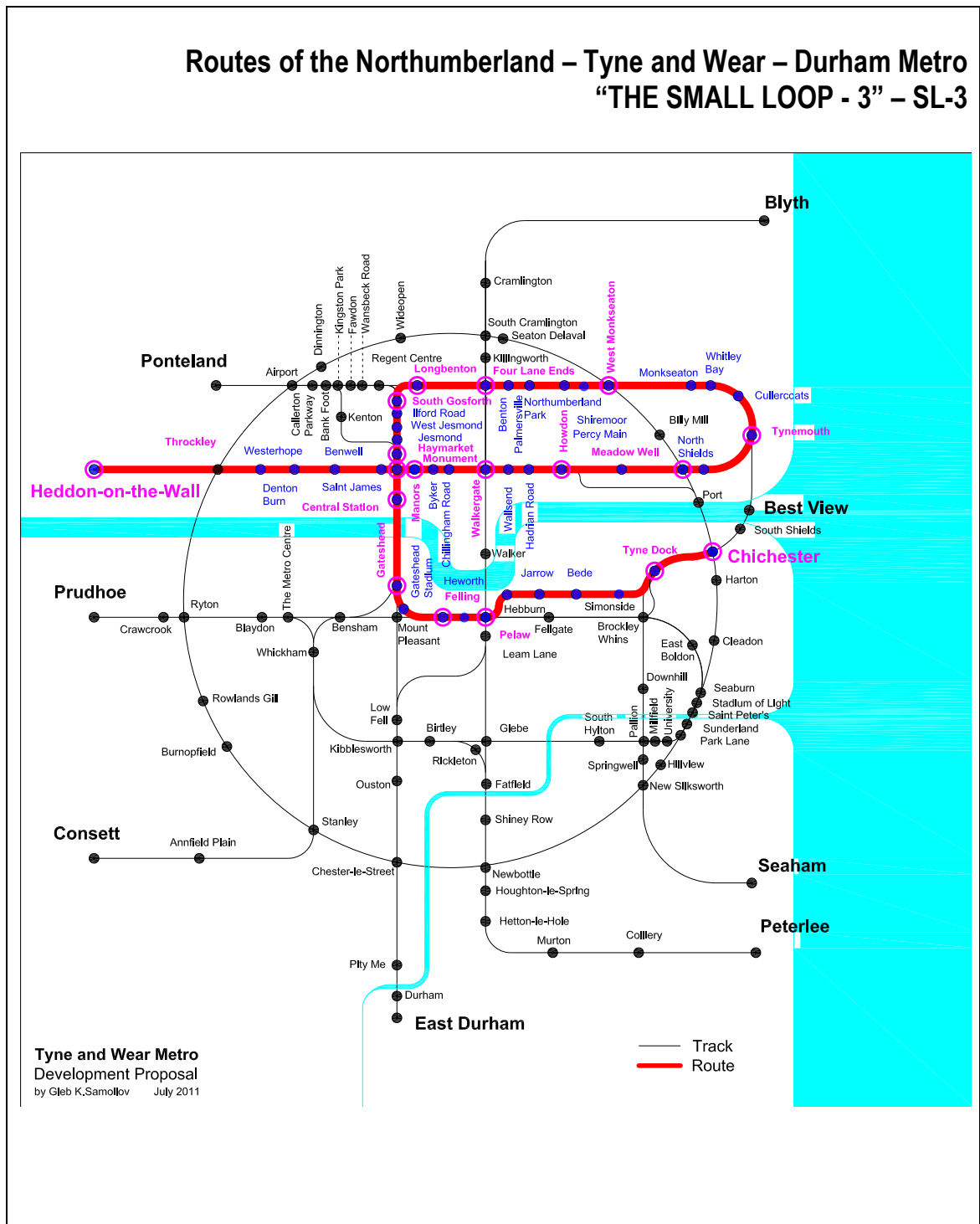


Figure 31.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SMALL LOOP - 3” – SL-3.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Simonside, Bede, Jarrow, Hebburn, Pelaw (the Interchange node), Felling (the Interchange node), Heworth, Gateshead Stadium, Gateshead (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Monument (the Interchange node), Saint James, Benwell, Denton Burn, Westerhope, Throckley, Heddon-on-the-Wall (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -3” Route (SL-3) is demonstrated on the Figure 31.

The Route “THE SMALL LOOP -4” (SL-4): *HEDDON-ON-THE-WALL – THROCKLEY – SAINT JAMES – MONUMENT – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 41 stations (17 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Monument (the Interchange node), Saint James, Benwell, Denton Burn, Westerhope, Throckley (the Interchange node), Heddon-on-the-Wall (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -4” Route (SL-4) is demonstrated on the Figure 32.

The Route “THE SMALL LOOP -5” (SL-5): *HEDDON-ON-THE-WALL – THROCKLEY – SAINT JAMES – MONUMENT – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – MOUNT PLEASANT – LOW FELL – KIBBLESWORTH – CHESTER-LE-STREET – EAST DURHAM*.

This Route has 44 stations (18 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Mount Pleasant (the Interchange node), Gateshead (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Monument (the Interchange node), Saint James, Benwell, Denton Burn, Westerhope, Throckley (the Interchange node), Heddon-on-the-Wall (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -5” Route (SL-5) is demonstrated on the Figure 33.

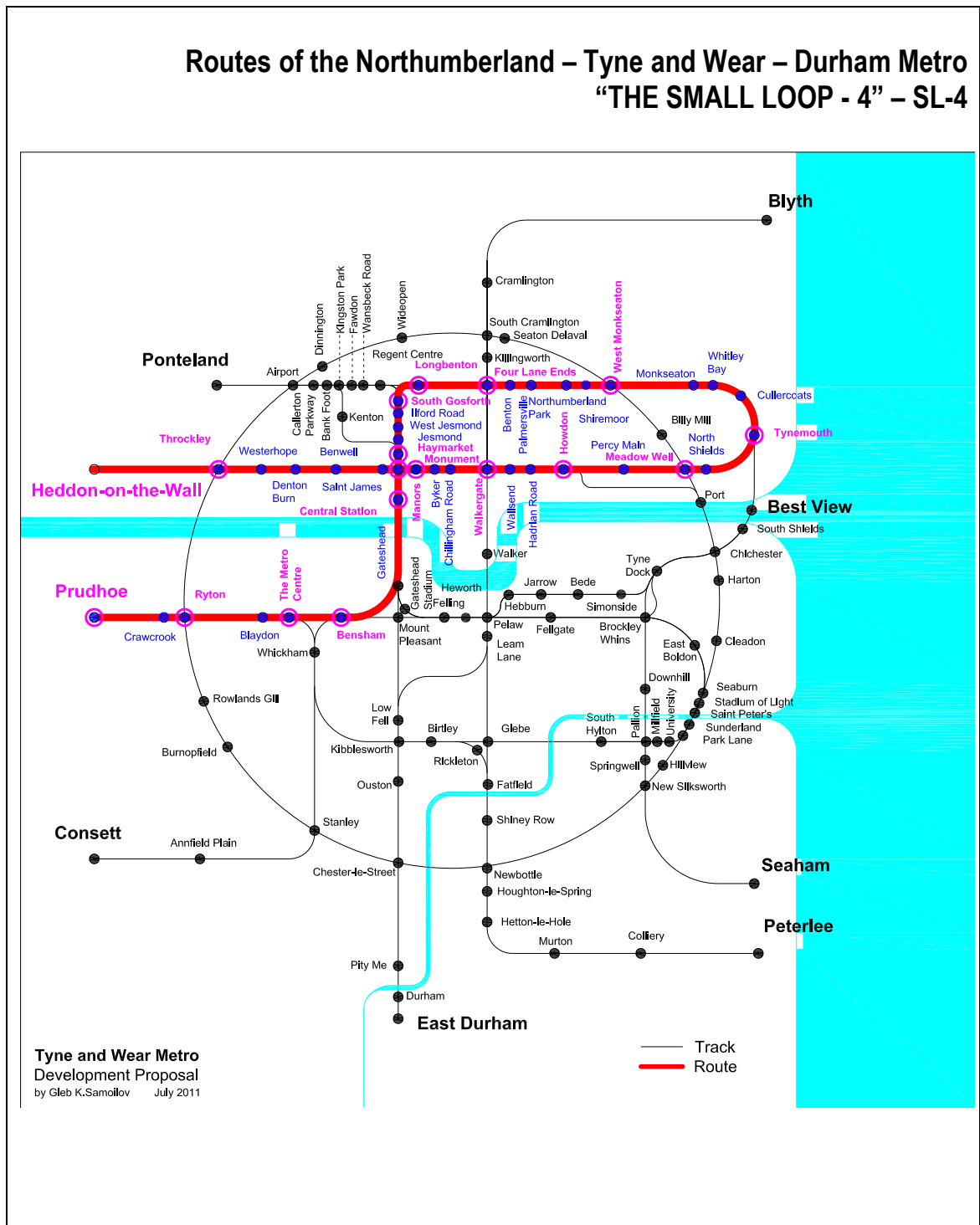


Figure 32.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SMALL LOOP - 4” – SL-4.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE SMALL LOOP -5” – SL-5

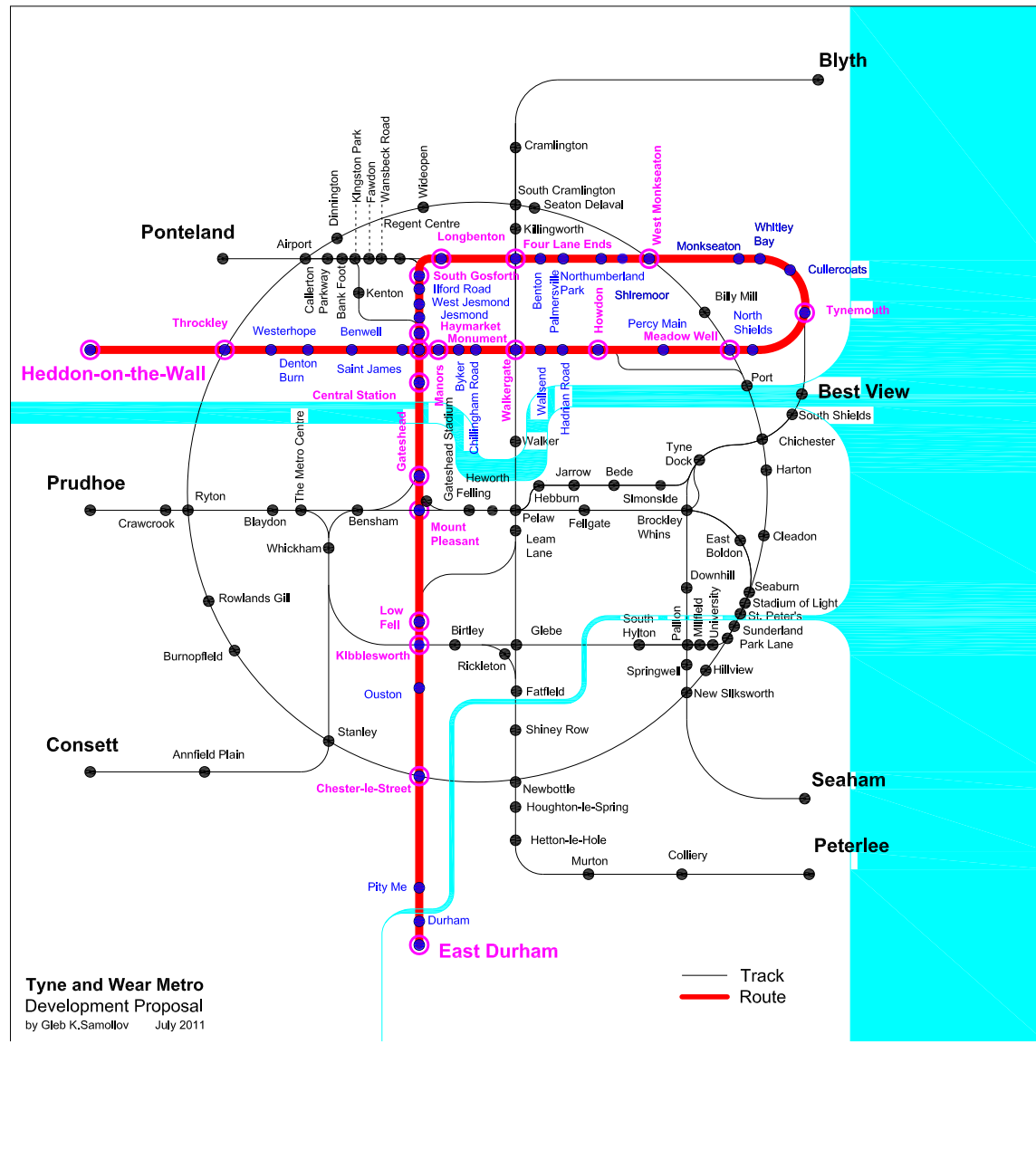


Figure 33.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SMALL LOOP -5” – SL-5.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

The Route “THE SMALL LOOP -6” (SL-6): *EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – MOUNT PLEASANT – GATESHEAD – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSHAM – WHICKHAM – STANLEY – CONSETT*.

This Route has 43 stations (21 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Mount Pleasant (the Interchange node), Gateshead (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Percy Main, Meadow Well (the Interchange node), North Shields, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Stanley (the Interchange node), Annfield Plain, Consett (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -6” Route (SL-6) is demonstrated on the Figure 34.

The Route “THE SMALL LOOP -7” (SL-7): **EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – MOUNT PLEASANT – GATESHEAD – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSHAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 44 stations (21 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Mount Pleasant (the Interchange node), Gateshead (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Percy Main, Meadow Well (the Interchange node), North Shields, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -7” Route (SL-7) is demonstrated on the Figure 35.

The Route “THE SMALL LOOP -8” (SL-8): *HEDDON-ON-THE-WALL – THROCKLEY – SAINT JAMES – MONUMENT – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSHAM – WHICKHAM – STANLEY – CONSETT*.

This Route has 40 stations (17 interchange nodes): Consett (the Initial station / the Final station – conditionally), Annfield Plain, Stanley (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node),

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE SMALL LOOP - 6” – SL-6

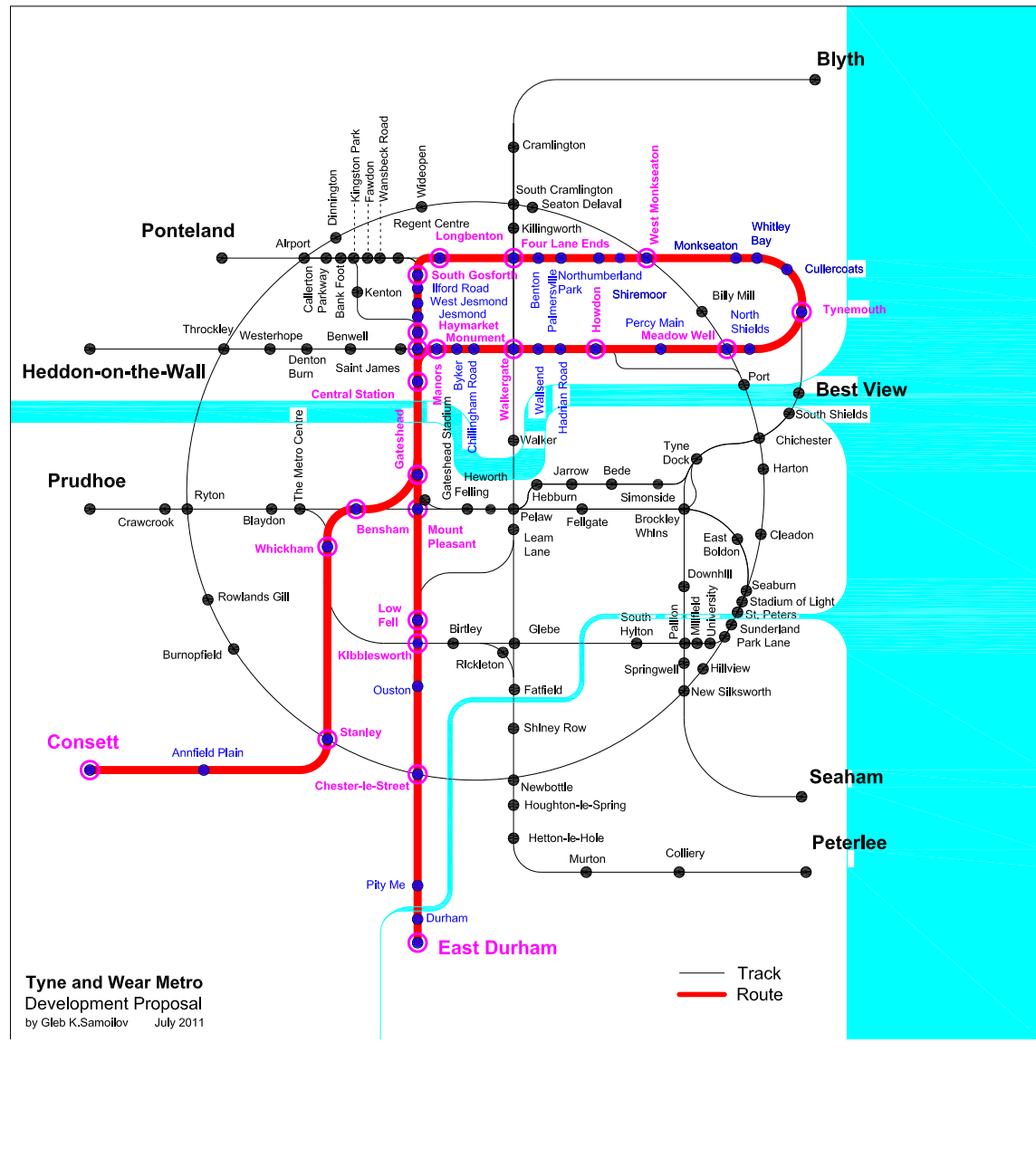


Figure 34.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SMALL LOOP - 6” – SL-6.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE SMALL LOOP -8” – SL-8

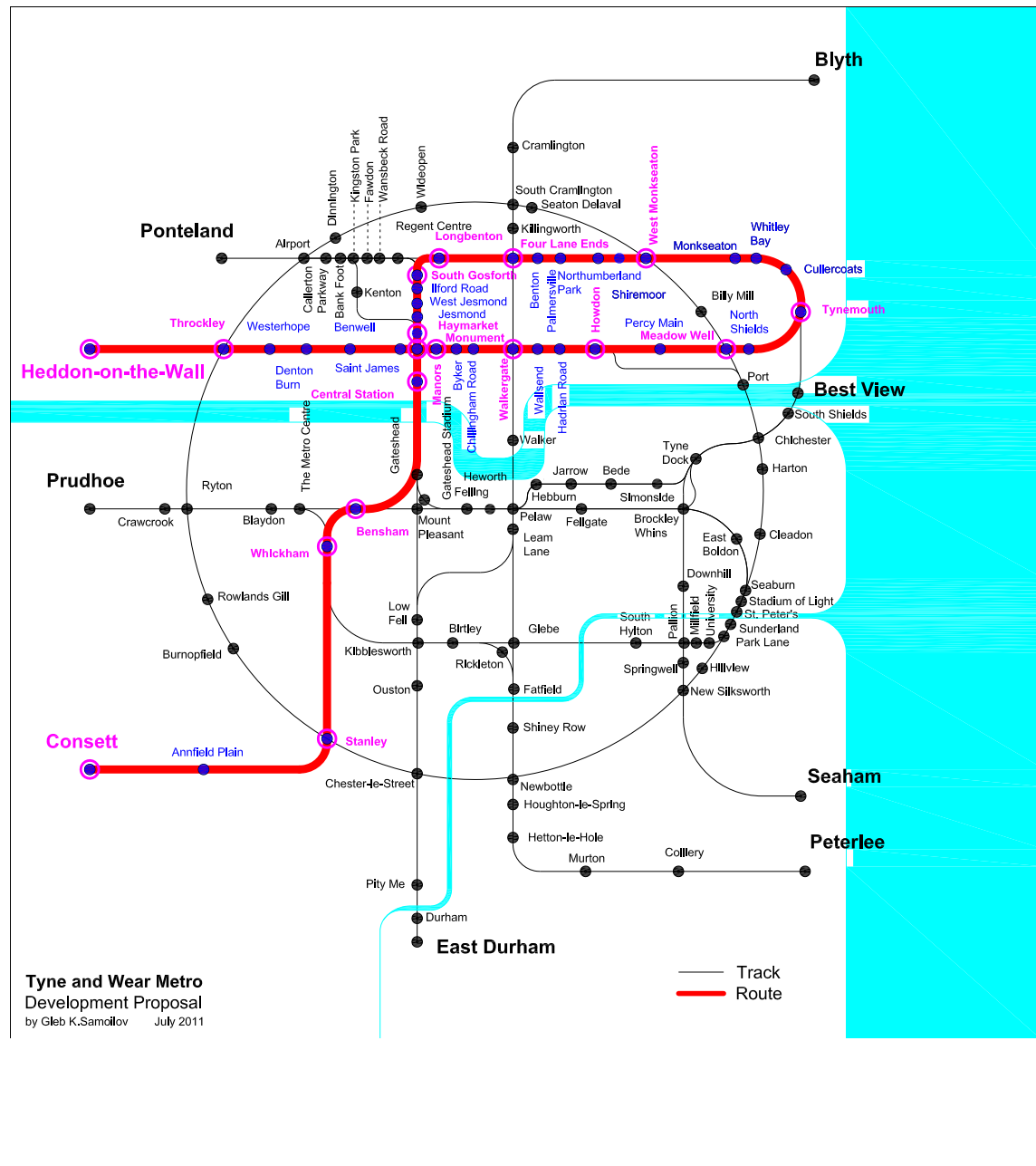


Figure 36.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SMALL LOOP -8” – SL-8.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

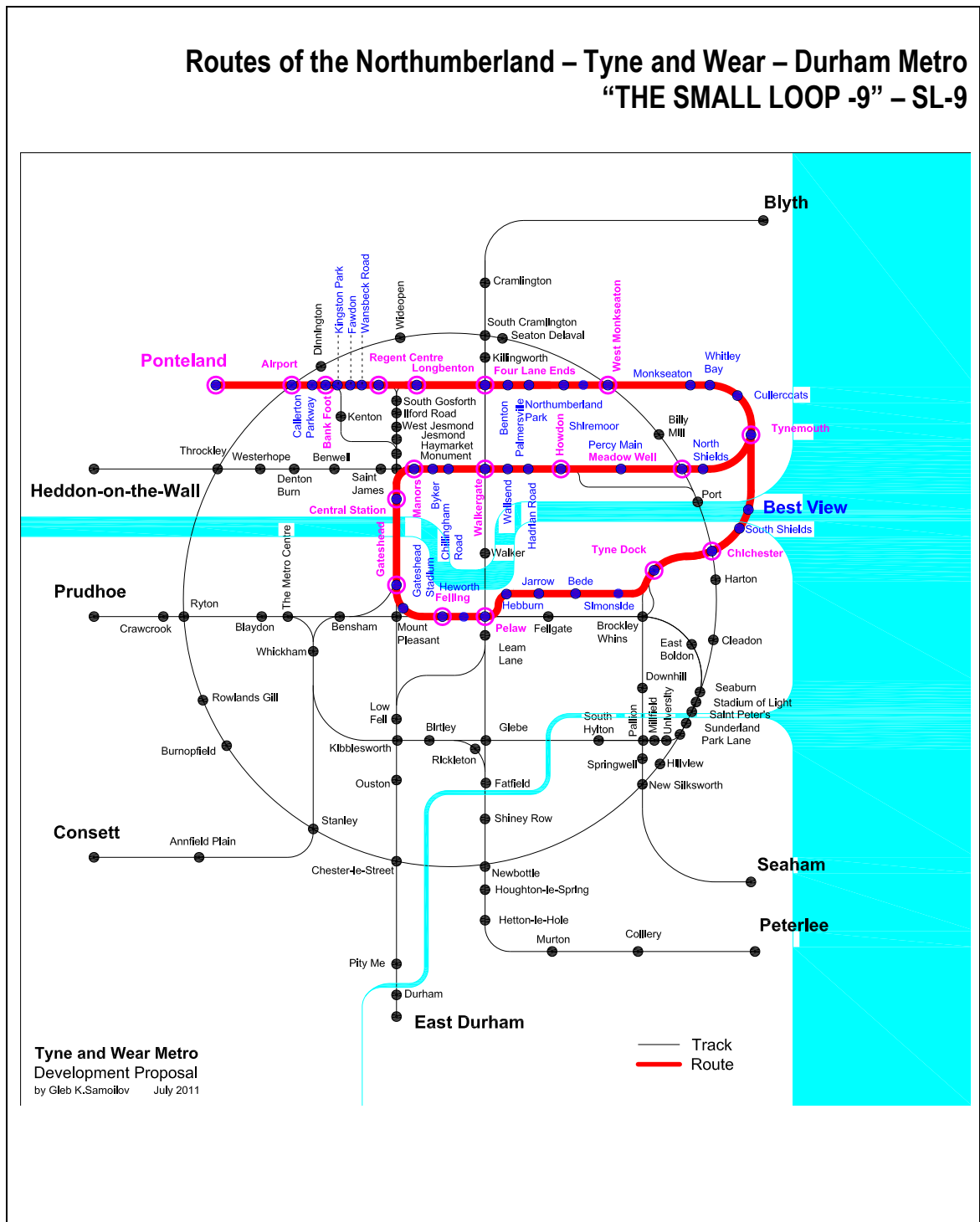


Figure 37.
 Routes of the Northumberland – Tyne and Wear – Durham Metro
 “THE SMALL LOOP -9” – SL-9.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Monument (the Interchange node), Saint James, Benwell, Denton Burn, Westerhope, Throckley (the Interchange node), Heddon-on-the-Wall (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -8” Route (SL-8) is demonstrated on the Figure 36.

The Route “THE SMALL LOOP -9” (SL-9): *PONTELAND – AIRPORT – BANK FOOT – REGENT CENTRE – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – CHICHESTER – TYNE DOCK – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – REGENT CENTRE – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 61 stations (23 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kingston Park, Fawdon, Wansbeck Road, Regent Centre (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Gateshead Stadium, Felling (the Interchange node), Heworth, Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Small Loop -9” Route (SL-9) is demonstrated on the Figure 37.

3 Routes of “THE DOUBLE LOOP” (DL) type.

The Route “THE DOUBLE LOOP -1” (DL-1): *PRUDHOE – RYTON – BLAYDON – THE METRO CENTRE – BENSHAM – MOUNT PLEASANT – FELLING – PELAW – BROCKLEY WHINS – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – SOUTH SHIELDS – CHICHESTER – TYNE DOCK – PELAW – FELLING – MOUNT PLEASANT – BENSHAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 62 stations (32 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields,

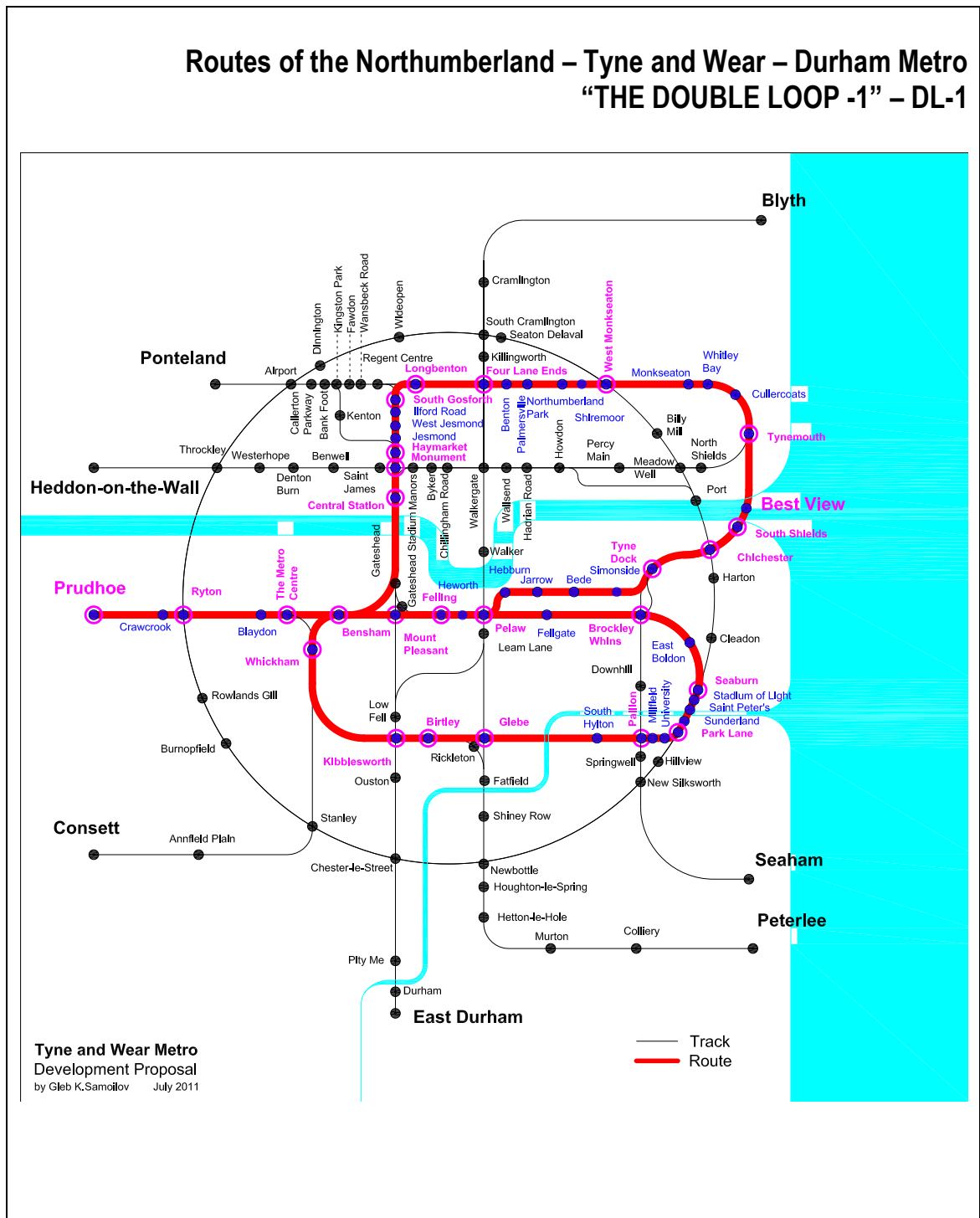


Figure 38.
 Routes of the Northumberland – Tyne and Wear – Durham Metro
 “THE DOUBLE LOOP -1” – DL-1.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE DOUBLE LOOP -2” – DL-2

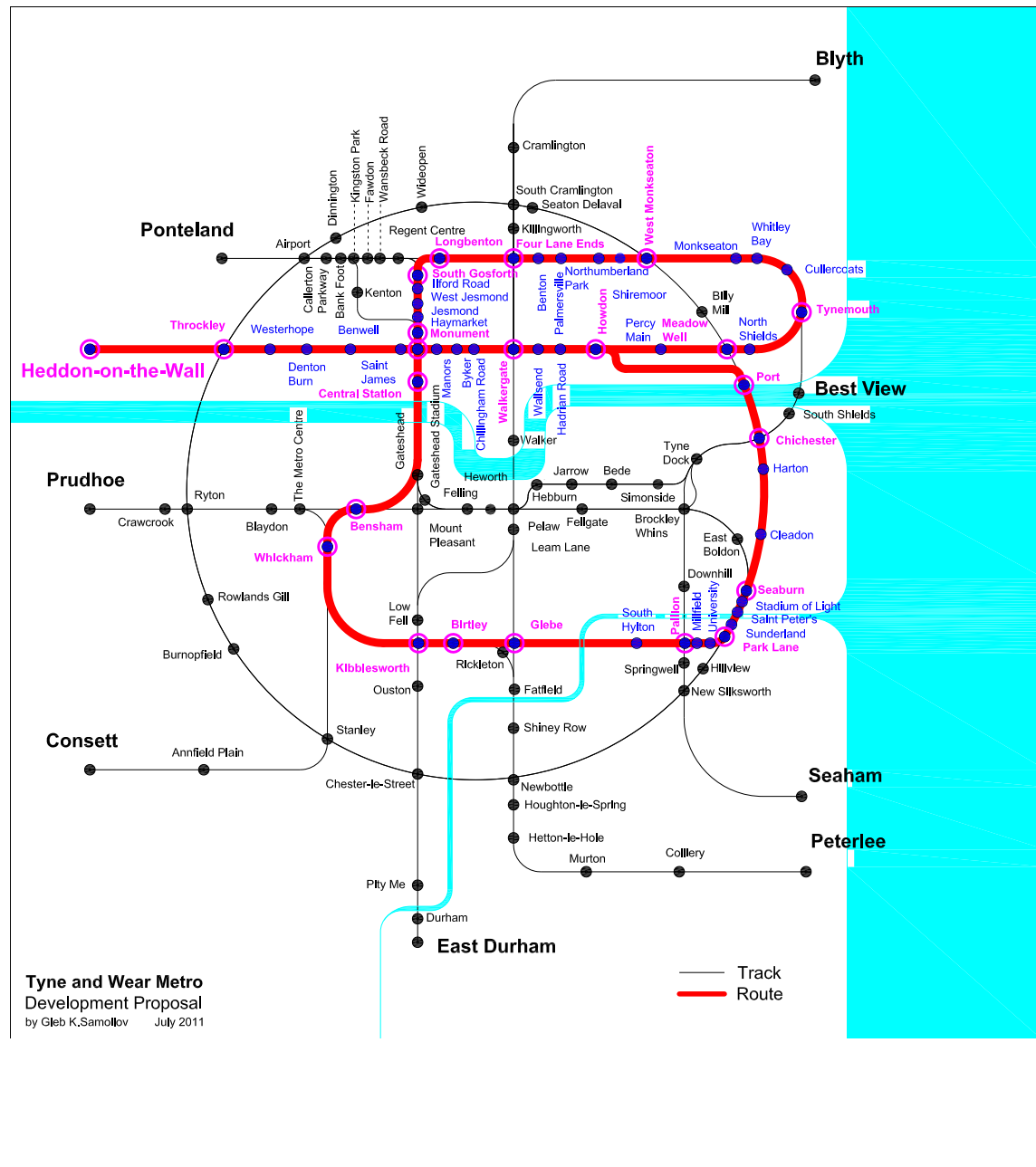


Figure 39.
 Routes of the Northumberland – Tyne and Wear – Durham Metro
 “THE DOUBLE LOOP -2” – DL-2.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Mount Pleasant (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Double Loop -1” Route (DL-1) is demonstrated on the Figure 38.

The Route “THE DOUBLE LOOP -2” (DL-2): *HEDDON-ON-THE-WALL – THROCKLEY – MONUMENT – WALKERGATE – HOWDON – MEADOW WELL – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSHAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – CHICHESTER – PORT – HOWDON – WALKERGATE – MONUMENT – THROCKLEY – HEDDON-ON-THE-WALL*.

This Route has 67 stations (29 interchange nodes): Heddon-on-the-Wall (the Initial station / the Final station – conditionally), Throckley (the Interchange node), Westerhope, Denton Burn, Benwell, Saint James, Monument (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Port (the Interchange node), Chichester (the Interchange node), Harton, Cleadon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Monument (the Interchange node), Saint James, Benwell, Denton Burn, Westerhope, Throckley (the Interchange node), Heddon-on-the-Wall (the Initial station / the Final station – conditionally). The scheme of “The Double Loop -2” Route (DL-2) is demonstrated on the Figure 39.

The Route “THE DOUBLE LOOP -3” (DL-3): *PONTELAND – AIRPORT – BANK FOOT – REGENT CENTRE – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – MEADOW WELL – HOWDON – WALKERGATE – MANORS – CENTRAL STATION – GATESHEAD – FELLING – PELAW – BROCKLEY WHINS – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE DOUBLE LOOP -3” – DL-3

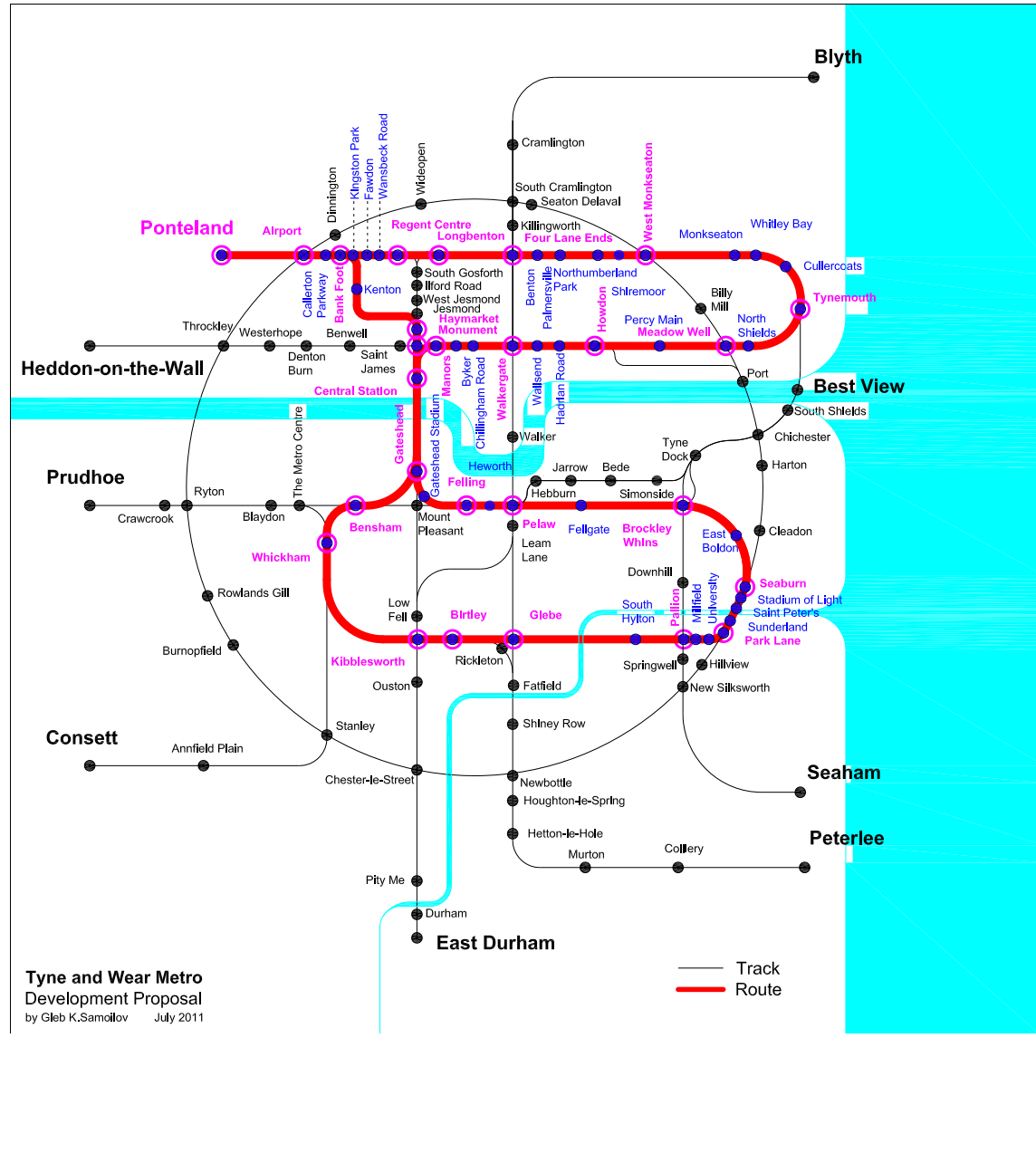


Figure 40.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE DOUBLE LOOP -3” – DL-3.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

This Route has 61 stations (30 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kenton, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Percy Main, Meadow Well (the Interchange node), North Shields, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of "The Double Loop -3" Route (DL-3) is demonstrated on the Figure 40.

7 Routes of "THE BIG LOOP" (BL) type.

The Route "THE BIG LOOP -1" (BL-1): *PRUDHOE – RYTON – BLAYDON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – CHICHESTER – PORT – HOWDON – WALKERGATE – MANORS – CENTRAL STATION – GATESHEAD – MOUNT PLEASANT – LOW FELL – KIBBLESWORTH – CHESTER-LE-STREET – EAST DURHAM*.

This Route has 39 stations (19 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Mount Pleasant (the Interchange node), Gateshead (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Port (the Interchange node), Chichester (the Interchange node), Harton, Cleadon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of "The Big Loop -1" Route (BL-1) is demonstrated on the Figure 41.

The Route "THE BIG LOOP -2" (BL-2): *PRUDHOE – RYTON – BLAYDON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – CHICHESTER – PORT HOWDON – WALKERGATE – MANORS – CENTRAL STATION – BENSHAM – WHICKHAM – STANLEY – CONSETT*.

This Route has 35 stations (17 interchange nodes): Consett (the Initial station / the Final station – conditionally), Annfield Plain, Stanley (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Port (the Interchange node),

Chichester (the Interchange node), Harton, Cleadon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of "The Big Loop -2" Route (BL-2) is demonstrated on the Figure 42.

The Route "THE BIG LOOP -3" (BL-3): *PRUDHOE – RYTON – BLAYDON – THE METRO CENTRE – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE DOCK – BROCKLEY WHINS – PELAW – FELLING – MOUNT PLEASANT – BENSHAM – WHICKHAM – STANLEY – CONSETT*.

This Route has 38 stations (20 interchange nodes): Consett (the Initial station / the Final station – conditionally), Annfield Plain, Stanley (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Pelaw (the Interchange node), Fellgate, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of "The Big Loop -3" Route (BL-3) is demonstrated on the Figure 43.

The Route "THE BIG LOOP -4" (BL-4): *PETERLEE – MURTON – NEWBOTTLE – FATFIELD – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE DOCK – BEDE – PELAW – LEAM LANE – GLEBE – FATFIELD – NEWBOTTLE – EASINGTON COLLIERY – PETERLEE*.

This Route has 50 stations (21 interchange nodes): Peterlee (the Initial station / the Final station – conditionally), Easington Colliery, Murton, Hetton-le-Hole, Houghton-le-Spring, Newbottle (the Interchange node), Shiney Row, Fatfield (the Interchange node), Glebe (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Rickleton, Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Easington Colliery, Peterlee (the Initial station / the Final station – conditionally). The scheme of "The Big Loop -4" Route (BL-4) is demonstrated on the Figure 44.

The Route "THE BIG LOOP -5" (BL-5): *EAST DURHAM – PITY ME – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – MOUNT PLEASANT – GATESHEAD – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE BIG LOOP -4” – BL-4

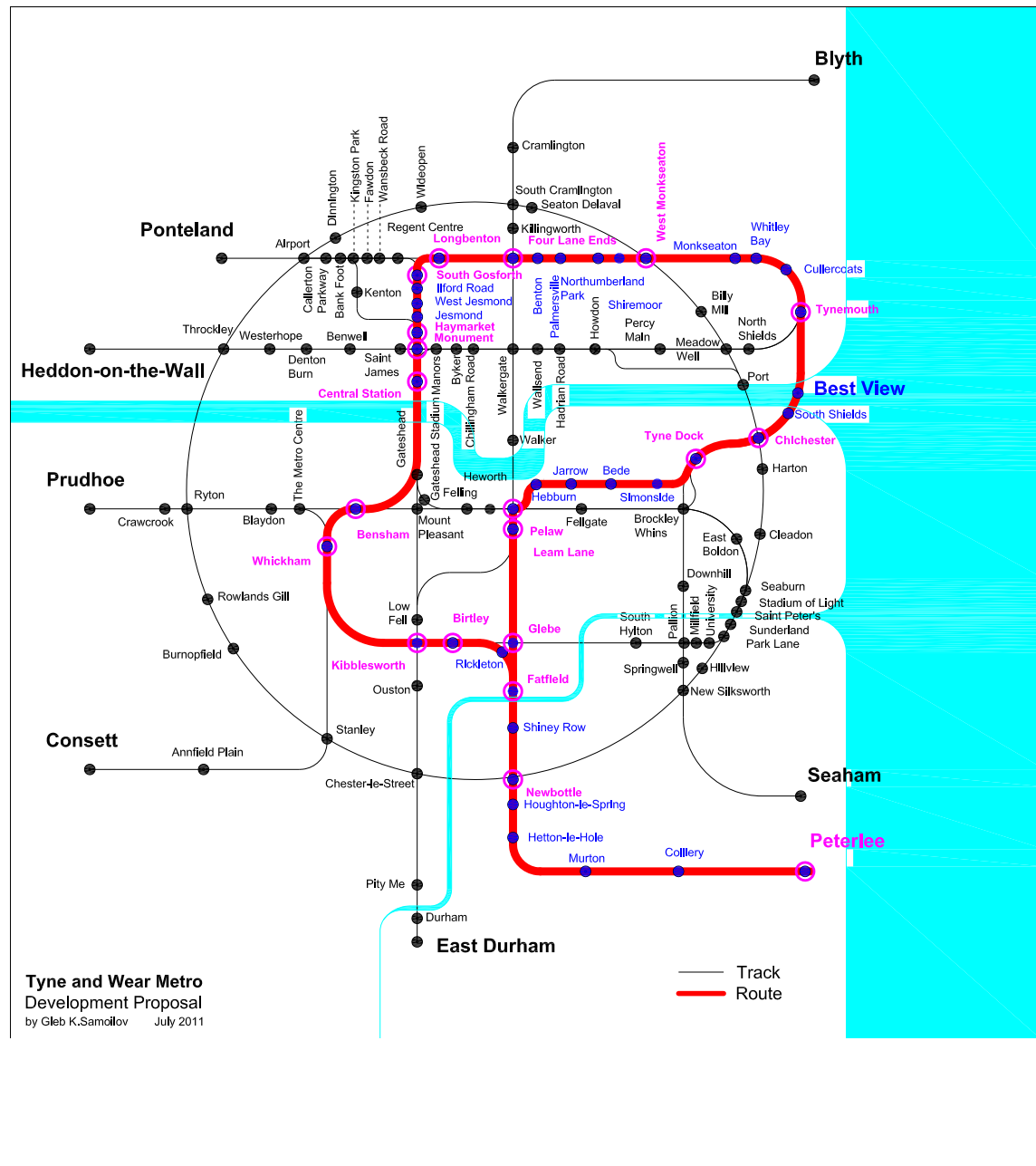


Figure 44.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG LOOP -4” – BL-4.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

DOCK – JARROW – PELAW – LEAM LANE – LOW FELL – KIBBLESWORTH – OUSTON – CHESTER-LE-STREET – EAST DURHAM*.

This Route has 44 stations (20 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Mount Pleasant (the Interchange node), Low Fell (the Interchange node), Kibblesworth (the Interchange node), Ouston, Chester-le-Street (the Interchange node), Pity Me, Durham, East Durham (the Initial station / the Final station – conditionally). The scheme of “The Big Loop -5” Route (BL-5) is demonstrated on the Figure 45.

The Route “THE BIG LOOP -6” (BL-6): *PONTELAND – AIRPORT – BANK FOOT – REGENT CENTRE – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE DOCK – SIMONSDIE – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 39 stations (17 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kenton, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Gateshead Stadium, Felling (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Big Loop -6” Route (BL-6) is demonstrated on the Figure 46.

The Route “THE BIG LOOP -7” (BL-7): *PRUDHOE – RYTON – BLAYDON – THE METRO CENTRE – BENSAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE DOCK – BEDE – PELAW – FELLING – MOUNT PLEASANT – BENSAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 41 stations (19 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the

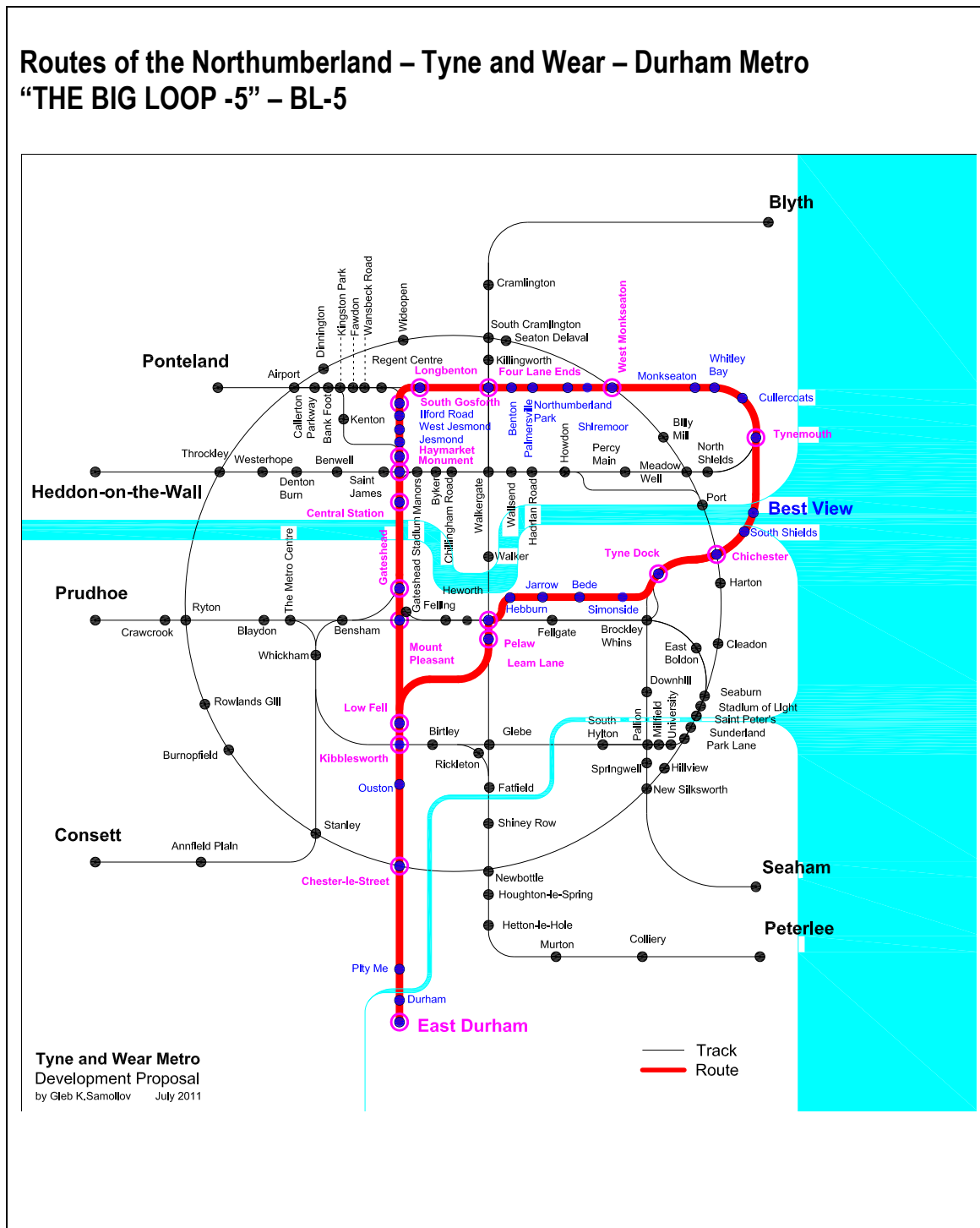


Figure 45.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG LOOP -5” – BL-5.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE BIG LOOP - 7” – BL-7

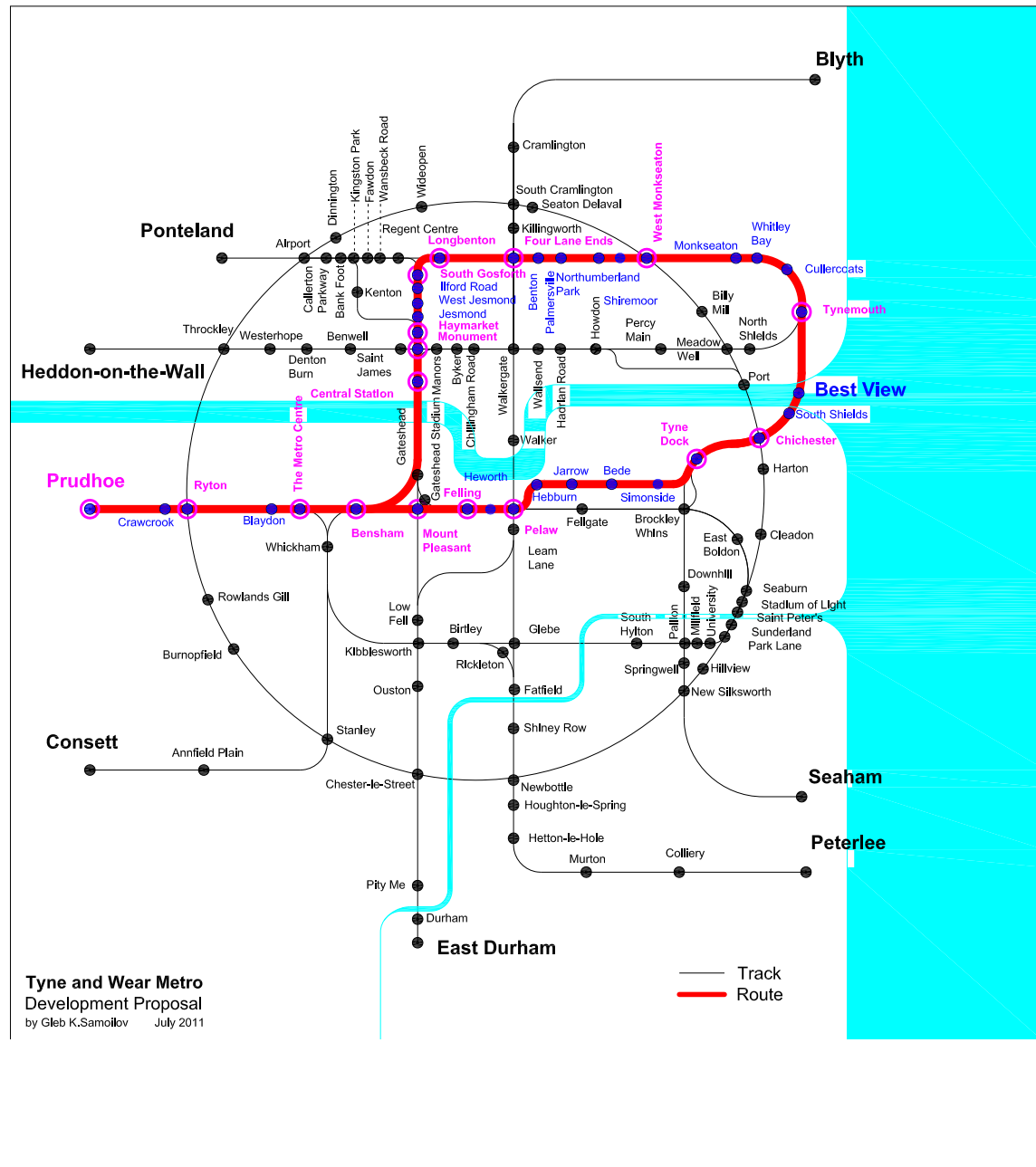


Figure 47.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG LOOP - 7” – BL-7.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Big Loop -7” Route (BL-7) is demonstrated on the Figure 47.

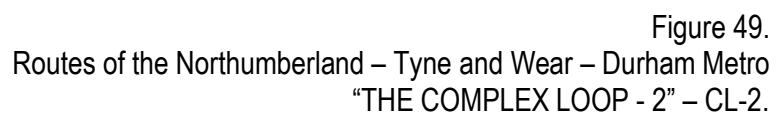
3 Main and 3 Additional Routes of “THE COMPLEX LOOP” (CL) type.

The Route “THE COMPLEX LOOP -1” (CL-1): *PONTELAND – AIRPORT – REGENT CENTRE – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – FELLING – PELAW – BROCKLEY WHINS – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE DOCK – BROCKLEY WHINS – PALLION – NEW SILKSWORTH – SEAHAM*.

This Route has 65 stations (32 interchange nodes): Seaham (the Initial station / the Final station – conditionally), New Silksworth (the Interchange node), Springwell, Pallion (the Interchange node), Downhill, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Complex Loop -1” Route (CL-1) is demonstrated on the Figure 48.

The Route “THE COMPLEX LOOP -2” (CL-2): *PRUDHOE – RYTON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – BEST VIEW – CHICHESTER – TYNE DOCK – JARROW – PELAW – LEAM LANE – GLEBE – NEWBOTTLE – PETERLEE*.

This Route has 63 stations (28 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Stations (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange



Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), Best View, South Shields, Chichester (the Interchange node), Tyne Dock (the Interchange node), Simonside, Bede, Jarrow, Hebburn, Pelaw (the Interchange node), Leam Lane (the Interchange node), Glebe (the Interchange node), Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Easington Colliery, Peterlee (the Initial station / the Final station – conditionally). The scheme of “The Complex Loop -2” Route (CL-2) is demonstrated on the Figure 49.

The Route “THE COMPLEX LOOP -3” (CL-3): *EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – LEAM LANE – PELAW – TYNE DOCK – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – FELLING – PELAW – BROCKLEY WHINS – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSAM – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 66 stations (32 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kenton, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Gateshead Stadium, Felling (the Interchange node), Heworth, Pelaw (the Interchange node), Fellgate, Brockley Whins (the Interchange node), East Boldon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, Weat Jesmond, Ilford Road, South Gosforts (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), Best View, South Shields, Chichester (the Interchange node), Tyne Dock (the Interchange node), Simonside, Bede, Jarrow, Hebburn, Pelaw (the Interchange node), Leam Lane (the Interchange node), Low Fell (the Interchange node), Kibblesworth (the Interchange node), Ouston, Chester-le-Street (the Interchange node), Pity Me, Durhan, East Durham (the Initial station / the Final station – conditionally). The scheme of “The Complex Loop -3” Route (CL-3) is demonstrated on the Figure 50.

Similar Complex Loop-shaped routes are possible from PETERLEE, CONSETT and PRUDHOE.

1 Main and 6 Additional Routes of “THE GRAND LOOP” (GL) type.

The Route “THE GRAND LOOP” (GL): *PETERLEE – HOUGHTON-LE-SPRING – NEWBOTTLE – FATFIELD – GLEBE – PELAW – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSAM – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – BROCKLEY WHINS – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MANORS – WALKERGATE – HOWDON – PORT – CHICHESTER – SEABURN – PARK LANE – NEW SILKSWORTH – NEWBOTTLE – CHESTER-LE-STREET – STANLEY – RYTON – THROCKLEY – AIRPORT – DINNINGTON – SOUTH CRAMLINGTON – WEST MONKSEATON – NORTH

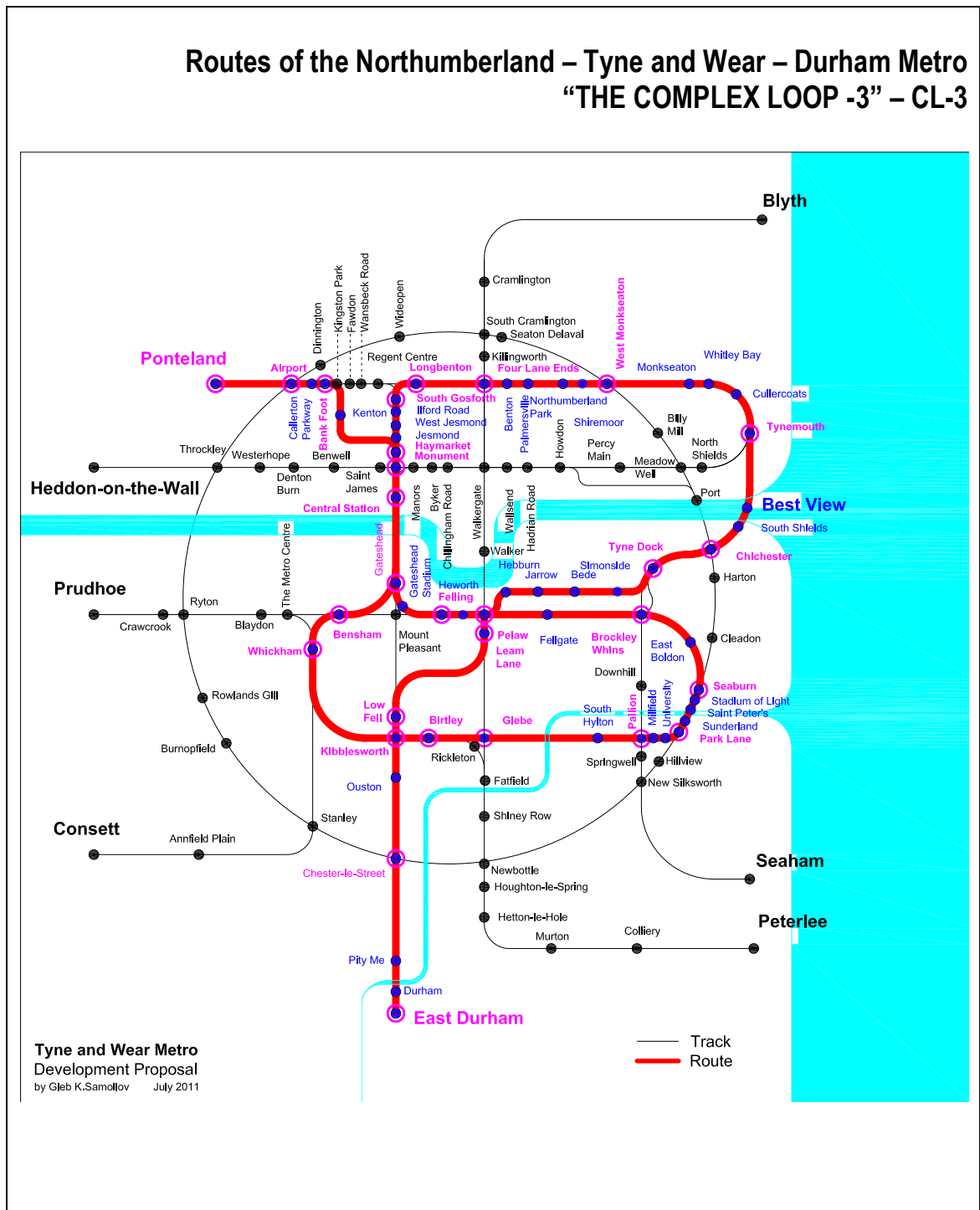


Figure 50.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE COMPLEX LOOP -3” – CL-3.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE GRAND LOOP” – GL

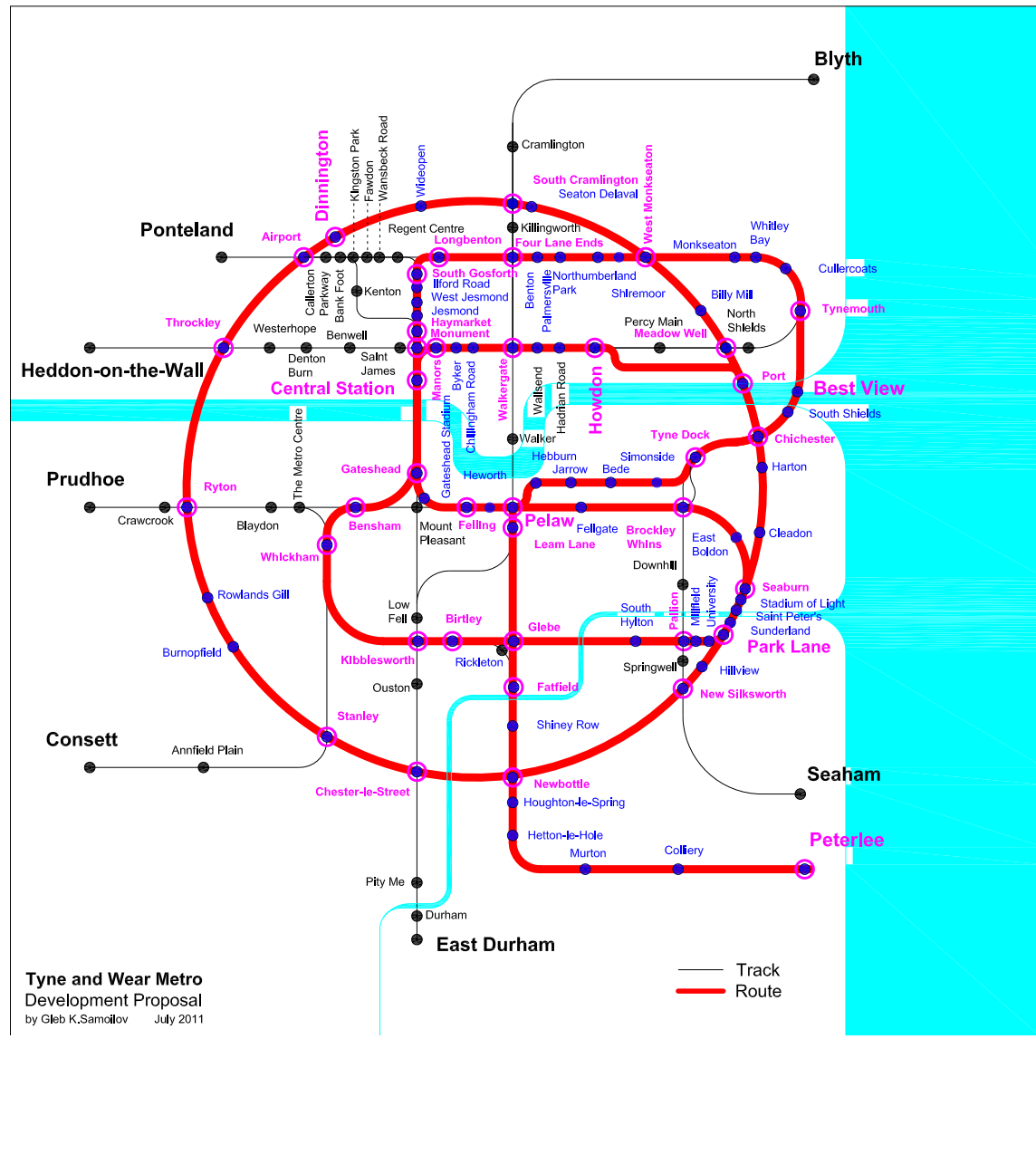


Figure 51.
 Routes of the Northumberland – Tyne and Wear – Durham Metro
 “THE GRAND LOOP” – GL.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

SHIELDS – PORT – CHICHESTER – SEABURN – PARK LANE – PALLION – GLEBE – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – CHICHESTER – TYNE DOCK – PELAW – GLEBE – FATFIELD – NEWBOTTLE – HETTON-LE-HOLE – COLLIERY – PETERLEE*

This Route has 147 stations (75 interchange nodes): Peterlee (the Initial station / the Final station), Easington Colliery, Murton, Hetton-le-Hole, Houghton-le-Spring, Newbottle (the Interchange node), Shiney Row, Fatfield (the Interchange node), Glebe (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange node), Meadow Well (the Interchange node), Billy Mill, West Monkseaton (the Interchange node), Seaton Delaval, South Cramlington (the Interchange node), Wideopen, Dinnington, Airport (the Interchange node), Throckley (the Interchange node), Ryton (the Interchange node), Rowlands Gill, Burnopfield, Stanley (the Interchange node), Chester-le-Street (the Interchange node), Newbottle (the Interchange node), New Silksworth (the Interchange node), Hillview, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), Cleadon, Harton, Chichester (the Interchange node), Port (the Interchange node), Howdon (the Interchange node), Hadrian Road, Wallsend, Walkergate (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Gateshead Stadium, Felling (the Interchange node), Heworth, Pelaw (the Interchange node), Fellgate, Brockley Whins (the Interchange node), East Boldon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), Best View, South Shields, Chichester (the Interchange node), Tyne Dock (the Interchange node), Simonside, Bede, Jarrow, Hebburn, Pelaw (the Interchange node), Leam Lane (the Interchange node), Glebe (the Interchange node), Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Easington Colliery, Peterlee (the Initial station / the Final station). The scheme of "The Grand Loop" Route (GL) is demonstrated on the Figure 51.

Similar Grand Loop-shaped routes are possible from SEAHAM, EAST DURHAM, CONSETT, PRUDHOE, HEDDON-ON-THE-WALL and PONTELAND.

11 Routes of “THE BIG WAVE” (BW) type.

The Route “The BIG WAVE -1” (BW-1): *CONSETT – STANLEY – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – CHICHESTER – TYNE DOCK – BROCKLEY WHINS – PALLION – NEW SILKSWORTH – SEAHAM*.

This Route has 32 stations (16 interchange nodes): Seaham (the Initial station / the Final station – conditionally), New Silksworth (the Interchange node), Springwell, Pallion (the Interchange node), Downhill, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Stanley (the Interchange node), Annfield Plain, Consett (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -1” Route (BW-1) is demonstrated on the Figure 52.

The Route “THE BIG WAVE -2” (BW-2): *CONSETT – STANLEY – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – CHICHESTER – TYNE DOCK – PELAW – LEAM LANE – GLEBE – FATFIELD – NEWBOTTLE – PETERLEE*.

This Route has 42 stations (18 interchange nodes): Peterlee (the Initial station / the Final station – conditionally), Easington Colliery, Murton, Hetton-le-Hole, Houghton-le-Spring, Newbottle (the Interchange node), Shiney Row, Fatfield (the Interchange node), Glebe (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Stanley (the Interchange node), Annfield Plain, Consett (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -2” Route (BW-2) is demonstrated on the Figure 53.

The Route “THE BIG WAVE -3” (BW-3): *PETERLEE – EASINGTON COLLIERY – NEWBOTTLE – FATFIELD – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSHAM – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – CHICHESTER – TYNE DOCK – BROCKLEY WHINS – PALLION – NEW SILKSWORTH – SEAHAM*.

This Route has 41 stations (19 interchange nodes): Seaham (the Initial station / the Final station – conditionally), New Silksworth (the Interchange node), Springwell, Pallion (the Interchange node), Downhill, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the

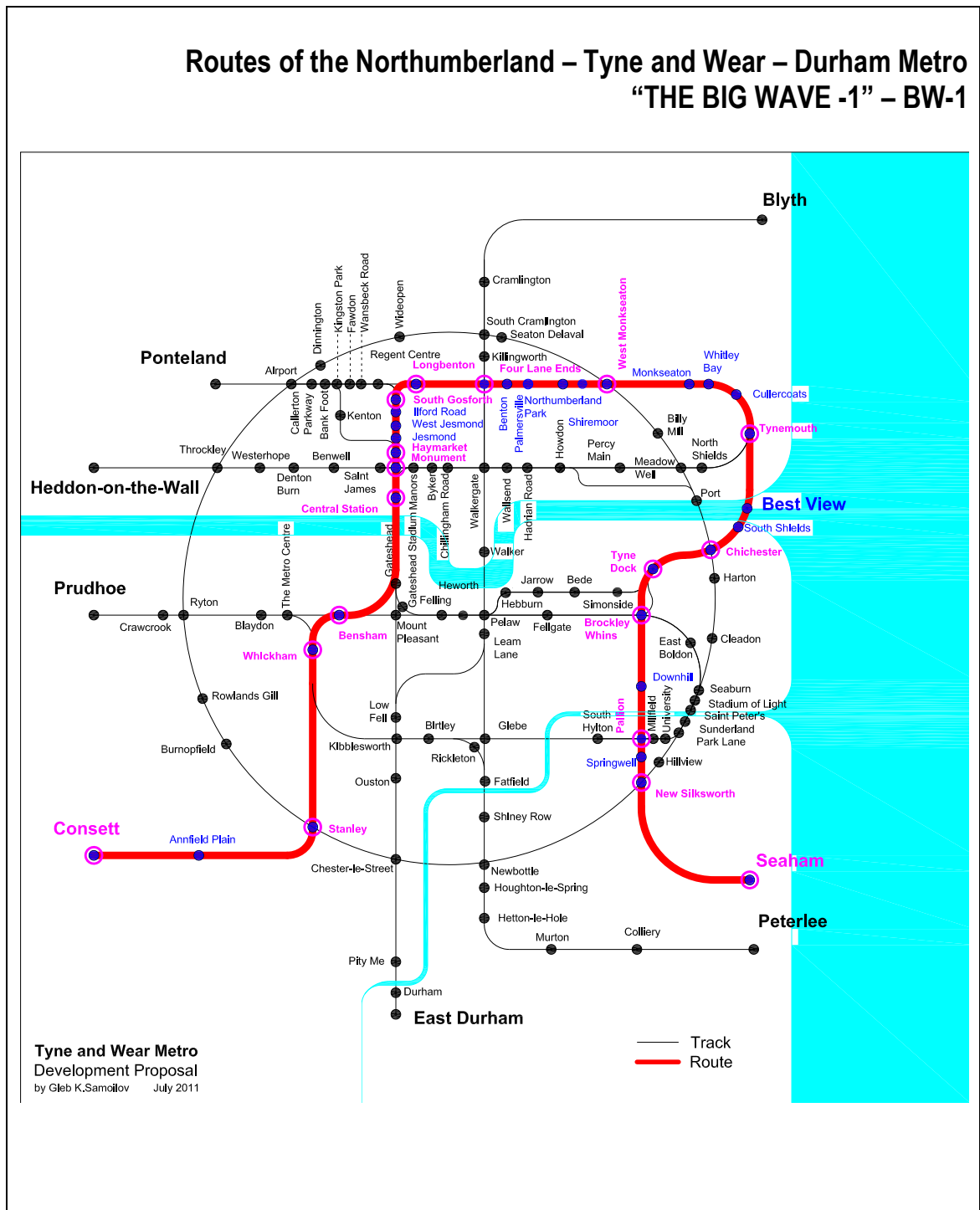


Figure 52.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG WAVE -1” – BW-1.

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE BIG WAVE - 2” – BW-2

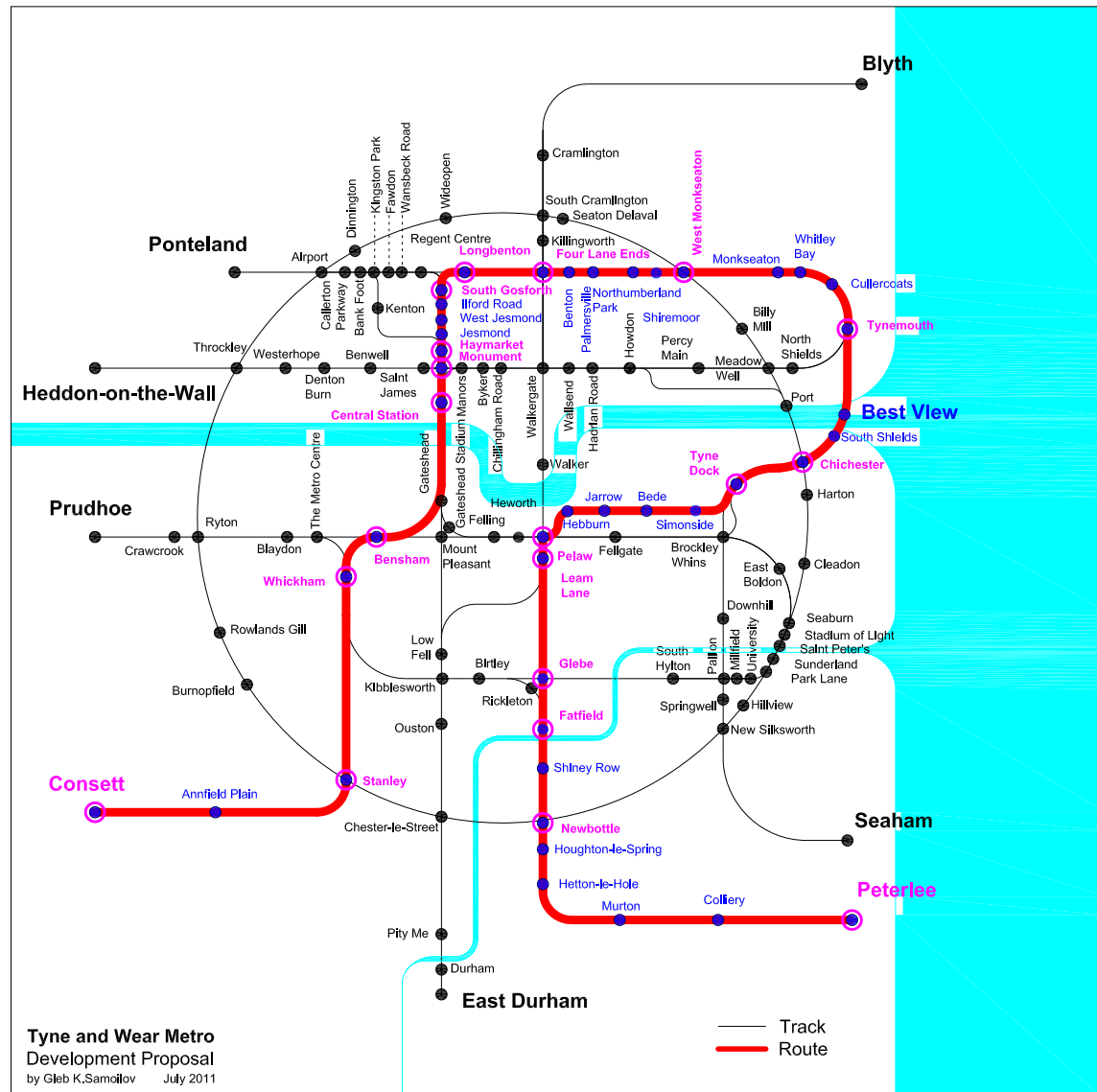


Figure 53.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG WAVE - 2” – BW-2.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

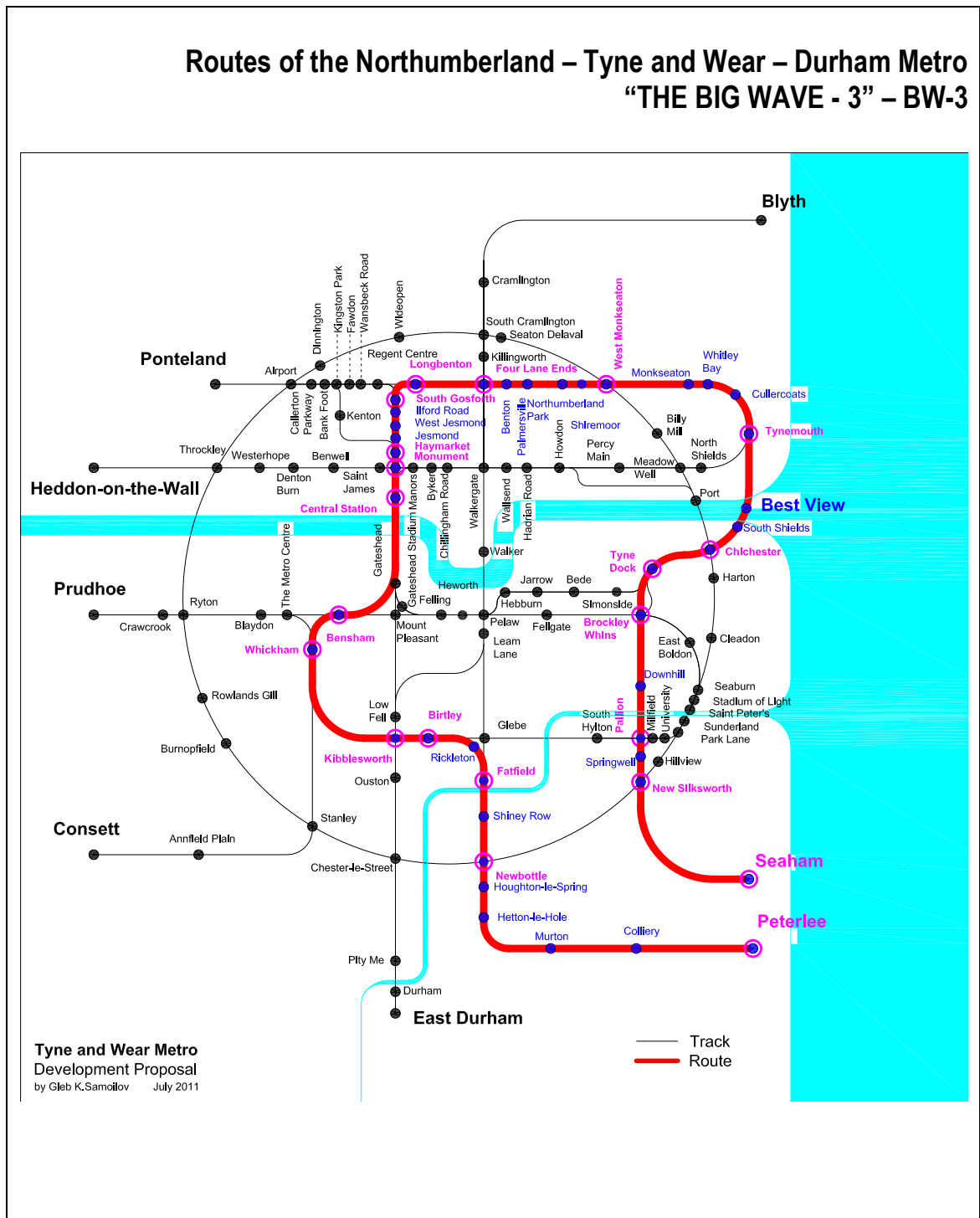


Figure 54.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG WAVE - 3” – BW-3.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Rickleton, Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Easington Colliery, Peterlee (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -3” Route (BW-3) is demonstrated on the Figure 54.

The Route “THE BIG WAVE -4” (BW-4): *EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – MOUNT PLEASANT – GATESHEAD – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – CHICHESTER – TYNE DOCK – BROCKLEY WHINS – PALLION – NEW SILKSWORTH – SEAHAM*.

This Route has 37 stations (18 interchange nodes): Seaham (the Initial station / the Final station – conditionally), New Silksworth (the Interchange node), Springwell, Pallion (the Interchange node), Downhill, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Mount Pleasant (the Interchange node), Low Fell (the Interchange node), Kibblesworth (the Interchange node), Ouston, Chester-le-Street (the Interchange node), Pity Me, Durham, East Durham (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -4” Route (BW-4) is demonstrated on the Figure 55.

The Route “THE BIG WAVE -5” (BW-5): *SEAHAM – NEW SILKSWORTH – PALLION – BROCKLEY WHINS – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSHAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 34 stations (16 interchange nodes): Seaham (the Initial station / the Final station – conditionally), New Silksworth (the Interchange node), Springwell, Pallion (the Interchange node), Downhill, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -5” Route (BW-5) is demonstrated on the Figure 56.

The Route “THE BIG WAVE -6” (BW-6): *PETERLEE – NEWBOTTLE – FATFIELD – GLEBE – LEAM LANE – PELAW – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – GATESHEAD – MOUNT PLEASANT – LOW FELL – KIBBLESWORTH – CHESTER-LE-STREET – EAST DURHAM*.

This Route has 46 stations (20 interchange nodes): Peterlee (the Initial station / the Final station – conditionally), Easington Colliery, Murton, Hetton-le-Hole, Houghton-le-Spring, Newbottle (the Interchange node), Shiney Row, Fatfield (the Interchange node), Glebe (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn,

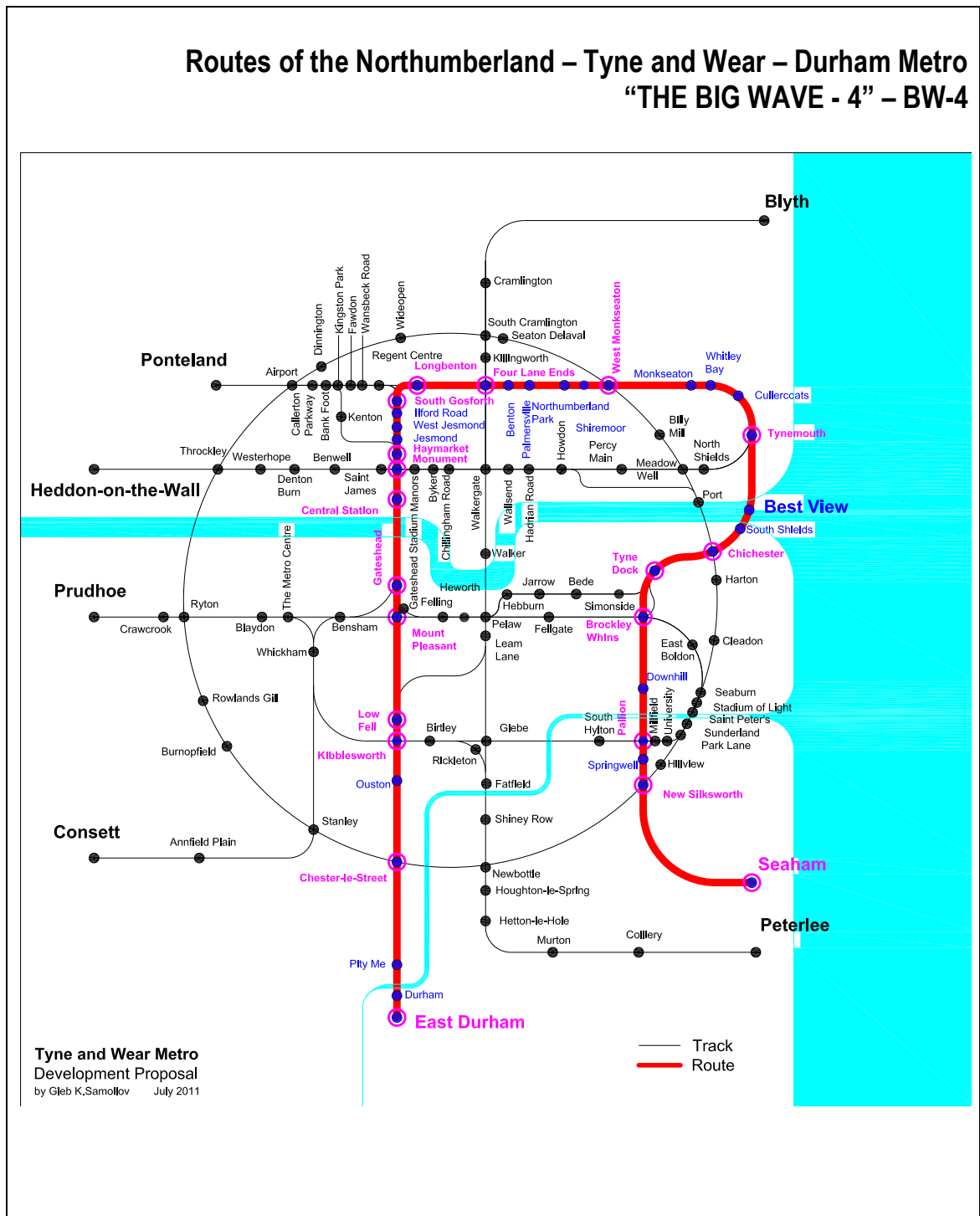


Figure 55.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG WAVE - 4” – BW-4.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

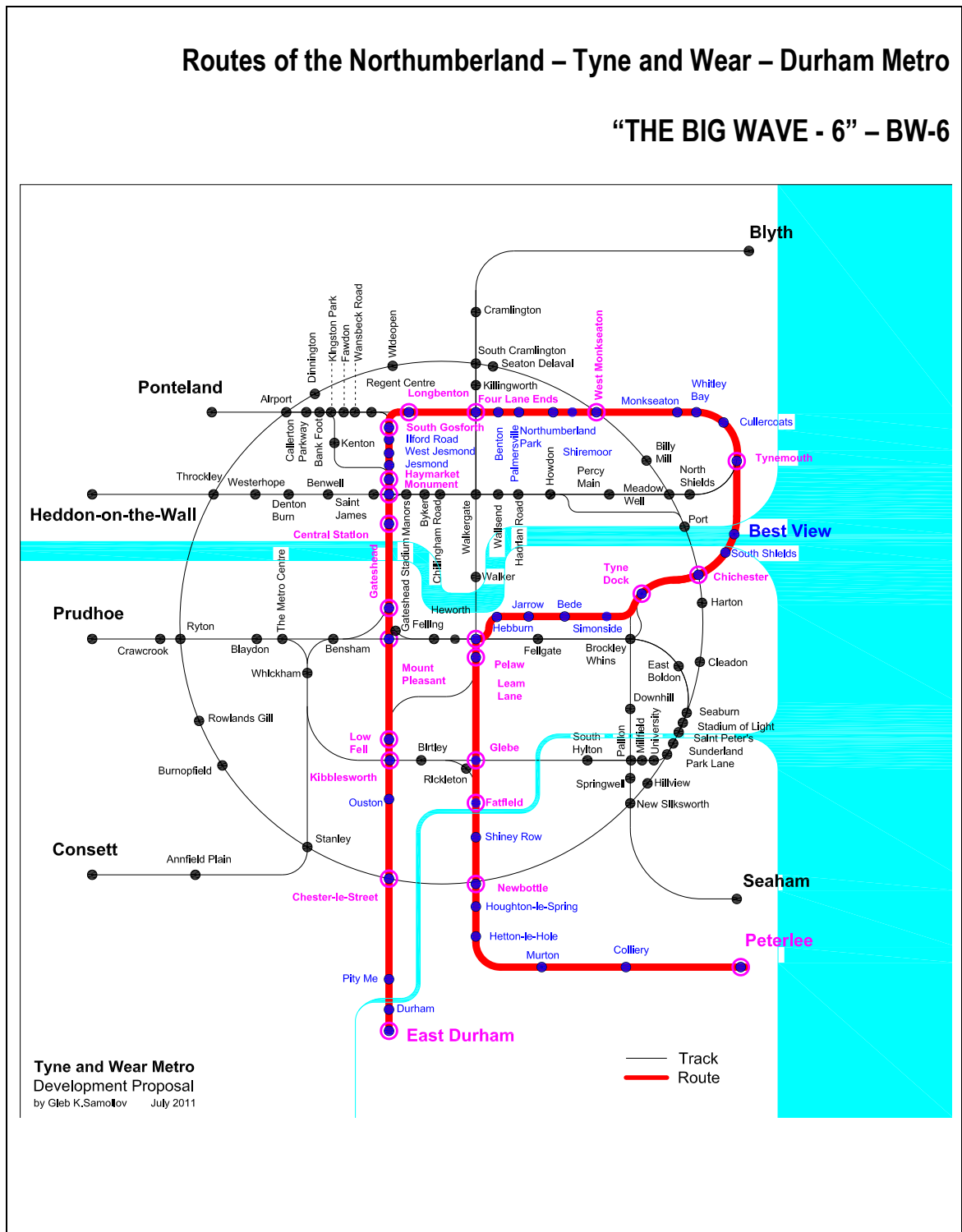


Figure 57.
 Routes of the Northumberland – Tyne and Wear – Durham Metro
 “THE BIG WAVE - 6” – BW-6.

Images source:
 Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Mount Pleasant (the Interchange node), Low Fell (the Interchange node), Kibblesworth (the Interchange node), Ouston, Chester-le-Street (the Interchange node), Pity Me, Durham, East Durham (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -6” Route (BW-6) is demonstrated on the Figure 57.

The Route “THE BIG WAVE -7” (BW-7): *PETERLEE – NEWBOTTLE FATFIELD GLEBE – LEAM LANE – PELAW – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 43 stations (18 interchange nodes): Peterlee (the Initial station / the Final station – conditionally), Easington Colliery, Murton, Hetton-le-Hole, Houghton-le-Spring, Newbottle (the Interchange node), Shiney Row, Fatfield (the Interchange node), Glebe (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -7” Route (BW-7) is demonstrated on the Figure 58.

The Route “THE BIG WAVE -8” (BW-8): *EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL LEAM LANE – PELAW – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – SOUTH GOSFORTH – HAYMARKET – MONUMENT – CENTRAL STATION – BENSAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 41 stations (18 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), South Gosforth (the Interchange node), Ilford Road, West Jesmond, Jesmond, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -8” Route (BW-8) is demonstrated on the Figure 59.

The Route “THE BIG WAVE -9” (BW-9): *CONSETT – STANLEY – WHICKHAM –

BENSHAM – MOUNT PLEASANT – FELLING PELAW – BROCKLEY WHINS – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – REGENT CENTRE – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 34 stations (15 interchange nodes): Consett (the Initial station / the Final station – conditionally), Annfield Plain, Stanley (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Pelaw (the Interchange node), Fellgate, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -9” Route (BW-9) is demonstrated on the Figure 60.

The Route “THE BIG WAVE -10” (BW-10): *PETERLEE – NEWBOTTLE – FATFIELD – FATFIELD – GLEBE – LEAM LANE – PELAW – TYNE DOCK – CHICHESTER – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – REGENT CENTRE – AIRPORT – PONTELAND*.

This Route has 38 stations (14 interchange nodes): Peterlee (the Initial station / the Final station – conditionally), Colliery, Murton, Hetton-le-Hole, Houghton-le-Spring, Newbottle (the Interchange node), Shiney Row, Fatfield (the Interchange node), Glebe (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -10” Route (BW-10) is demonstrated on the Figure 61.

The Route “THE BIG WAY -11” (BW-11): *EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – LEAM LANE – PELAW – TYNE DOCK – CHICHESTER – SOUTH SHIELDS – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – REGENT CENTRE – AIRPORT – PONTELAND*.

This Route has 36 stations (14 interchange nodes): East Durham (the Initial station / the Final station – conditionally), Durham, Pity Me, Chester-le-Street (the Interchange node), Ouston, Kibblesworth (the Interchange node), Low Fell (the Interchange node), Leam Lane (the Interchange node), Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Big Wave -11” Route (BW-11) is demonstrated on the Figure 62.

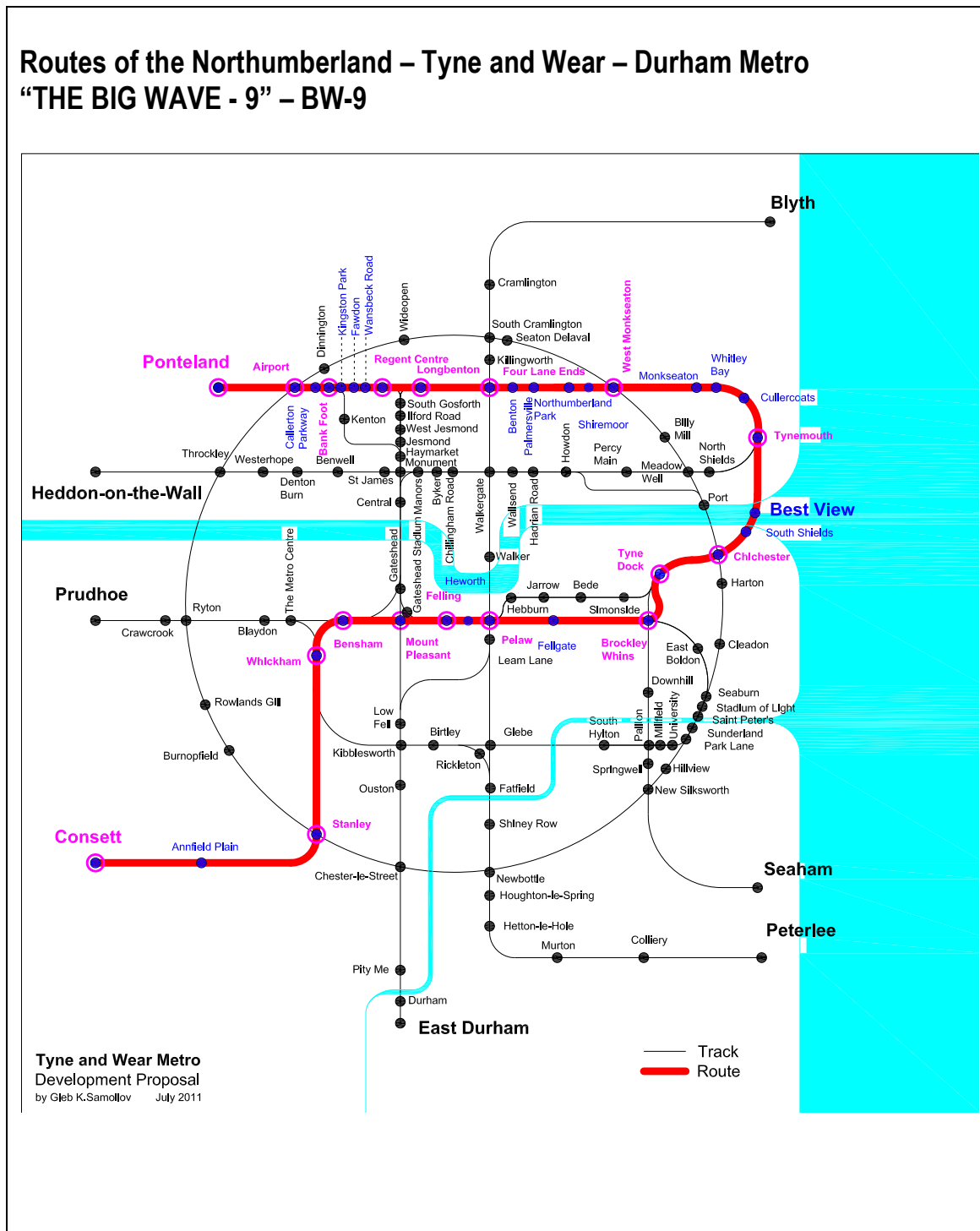
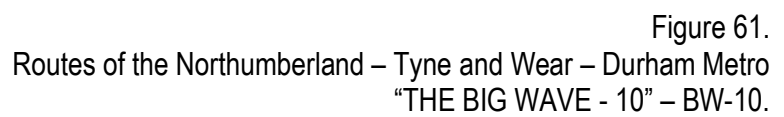


Figure 60.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE BIG WAVE - 8” – BW-8.
Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).



Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

11 Routes of "THE LONG RADIAL WAVE" (LRW) type.

The Route "THE LONG RADIAL WAVE -1" (LRW-1): *BLYTH – SOUTH CRAMLINGTON – FOUR LANE ENDS – WALKERGATE – WALKER – PELAW – LEAM LANE – LOW FELL – KIBBLESWORTH – CHESTER-LE-STREET – EAST DURHAM*.

This Route has 16 stations (8 interchange nodes): Blyth (the Initial station / the Final station – conditionally), Cramlington, South Cramlington (the Interchange node), Killingworth, Four Lane Ends (the Interchange node), Walkergate (the Interchange node), Walker, Pelaw (the Interchange node), Leam Lane (the Interchange node), Low Fell (the Interchange node), Kibblesworth (the Interchange node), Ouston, Chester-le-Street (the Interchange node), Pity Me, Durham, East Durham (the Initial station / the Final station – conditionally). The scheme of "The Long Radial Wave -1" Route (LRW-1) is demonstrated on the Figure 63.

The Route "THE LONG RADIAL WAVE -2" (LRW-2): *PRUDHOE – RYTON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – FATFIELD – NEWBOTTLE – HOUGHTON-LE-SPRING – PETERLEE*.

This Route has 17 stations (7 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Rickleton, Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Colliery, Peterlee (the Initial station / the Final station – conditionally). The scheme of "The Long Radial Wave -2" Route (LRW-2) is demonstrated on the Figure 64.

The Route "THE LONG RADIAL WAVE -3" (LRW-3): *SEAHAM – NEW SILKSWORTH – PALLION – BROCKLEY WHINS – TYNE DOCK – CHICHESTER – SOUTH SHIELDS – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – REGENT CENTRE – AIRPORT – PONTELAND*.

This Route has 29 stations (12 interchange nodes): Seaham (the Initial station / the Final station – conditionally), New Silksworth (the Interchange node), Springwell, Pallion (the Interchange node), Downhill, Brockley Whins (the Interchange node), Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of "The Long Radial Wave -3" Route (LRW-3) is demonstrated on the Figure 65.

The Route "THE LONG RADIAL WAVE -4" (LRW-4): *EAST DURHAM – CHESTER-LE-STREET – KIBBLESWORTH – LOW FELL – MOUNT PLEASANT – GATESHEAD – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 17 stations (10 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kenton, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Gateshead (the Interchange node), Mount Pleasant (the Interchange node), Low Fell (the Interchange node), Kibblesworth (the Interchange node), Ouston, Chester-le-Street (the Interchange node), Pity Me, Durham, East Durham (the Initial station / the Final station – conditionally). The scheme of "The Long Radial Wave -4" Route (LRW-4) is demonstrated on the Figure 66.

The Route "THE LONG RADIAL WAVE -5" (LRW-5): *PETERLEE – HETTON-LE-

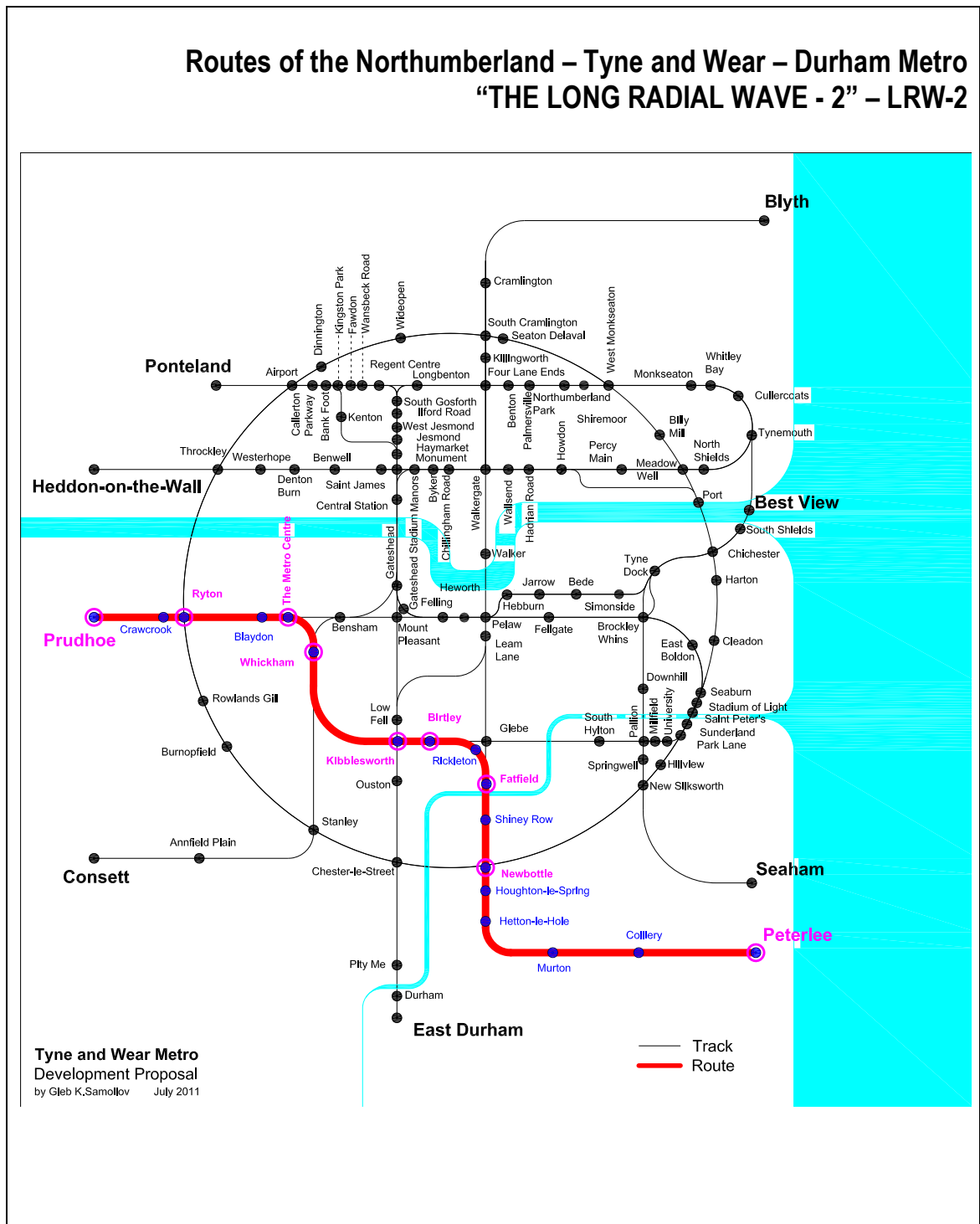


Figure 64.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 2” – LRW-2.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

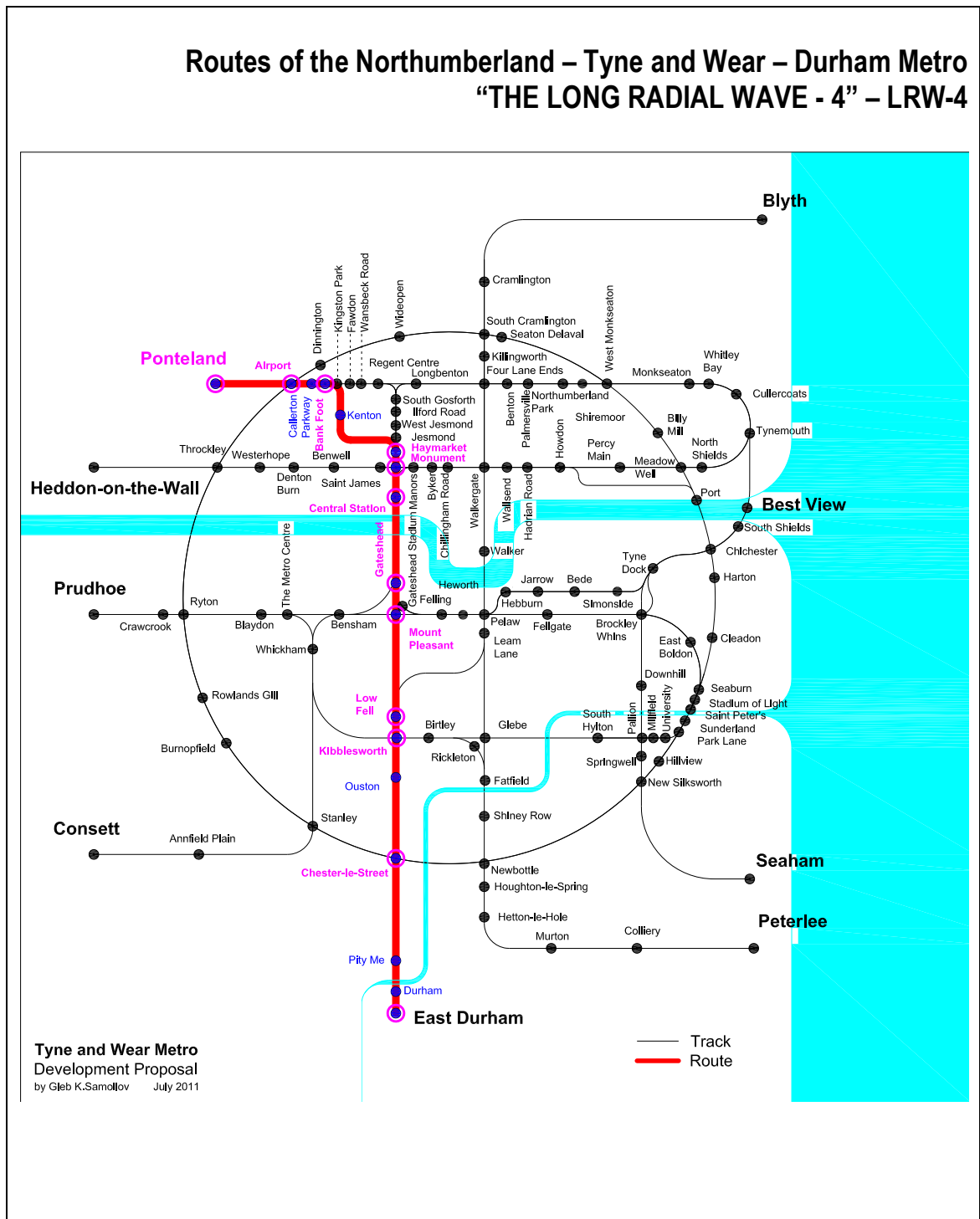


Figure 66.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 4” – LRW-4.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

HOLE – NEWBOTTLE – FATFIELD – BIRTLEY – KIBBLESWORTH – WHICKHAM – BENSAM – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 21 stations (11 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kenton, Haymarket (the Interchange node), Monument (the Interchange node), Central Station (the Interchange node), Bensham (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Rickleton, Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Easington Colliery, Peterlee (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave 5” Route (LRW-5) is demonstrated on the Figure 67.

The Route “THE LONG RADIAL WAVE -6” (LRW-6): *BLYTH – SOUTH CRAMLINGTON – FOUR LANE ENDS – WALKERGATE – PELAW – LEAM LANE – GLEBE – FATFIELD – NEWBOTTLE – PETERLEE*.

This Route has 18 stations (8 interchange nodes): Blyth (the Initial station / the Final station – conditionally), Cramlington, South Cramlington (the Interchange node), Killinworth, Four Lane Ends (the Interchange node), Walkergate (the Interchange node), Walker, Pelaw (the Interchange node), Leam Lane (the Interchange node), Glebe (the Interchange node), Fatfield (the Interchange node), Shiney Row, Newbottle (the Interchange node), Houghton-le-Spring, Hetton-le-Hole, Murton, Easington Colliery, Peterlee (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave -6” Route (LRW-6) is demonstrated on the Figure 68.

The Route “THE LONG RADIAL WAVE -7” (LRW-7): *PONTELAND – AIRPORT – BANK FOOT – REGENT CENTRE – LONGBENTON – FOUR LANE ENDS – WEST MONKSEATON – TYNEMOUTH – MEADOW WELL – HOWDON – MANORS – MONUMENT – DENTON BURN – THROCKLEY – HEDDON-ON-THE-WALL*.

This Route has 36 stations (13 interchange nodes): Ponteland (the Initial station / the Final station – conditionally), Airport (the Interchange node), Callerton Parkway, Bank Foot (the Interchange node), Kingston Park, Fawdon, Wansbeck Road, Regent Centre (the Interchange node), Longbenton (the Interchange node), Four Lane Ends (the Interchange node), Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton (the Interchange node), Monkseaton, Whitley Bay, Cullercoats, Tynemouth (the Interchange node), North Shields, Meadow Well (the Interchange node), Percy Main, Howdon (the Interchange node), Hadrian Road, Walkergate, Wallsend (the Interchange node), Chillingham Road, Byker, Manors (the Interchange node), Monument (the Interchange node), Saint James, Benwell, Denton Burn, Westerhope, Throckley (the Interchange node), Heddon-on-the-Wall (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave -7” Route (LRW-7) is demonstrated on the Figure 69.

The Route “THE LONG RADIAL WAVE -8” (LRW-8): *CONSETT – STANLEY – WHICKHAM – BENSAM – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – AIRPORT – PONTELAND*.

This Route has 13 stations (8 interchange nodes): Consett (the Initial station / the Final station – conditionally), Annfield Plain, Stanley (the Interchange node), Whickham (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Kenton, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave -8” Route

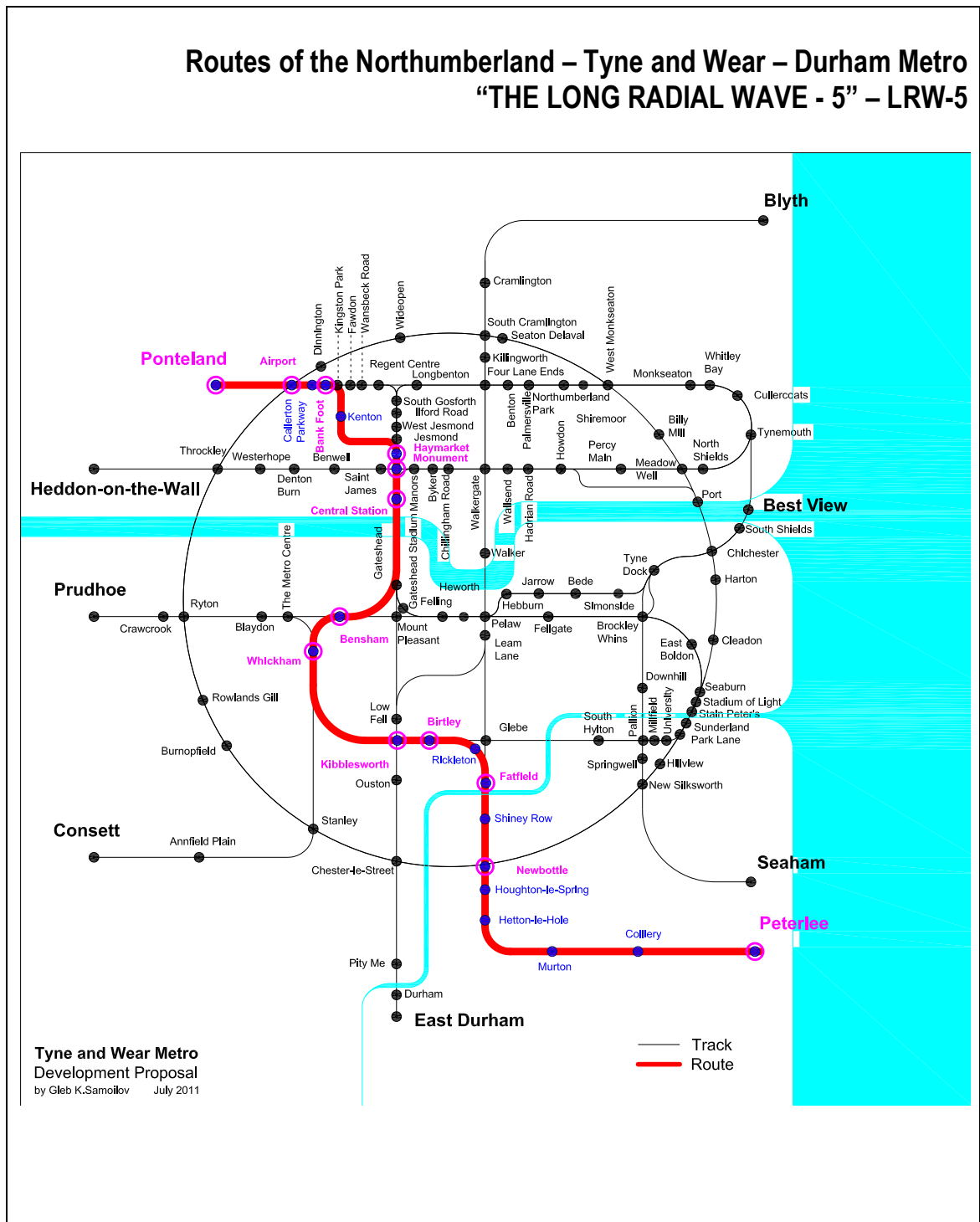


Figure 67.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 5” – LRW-5.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

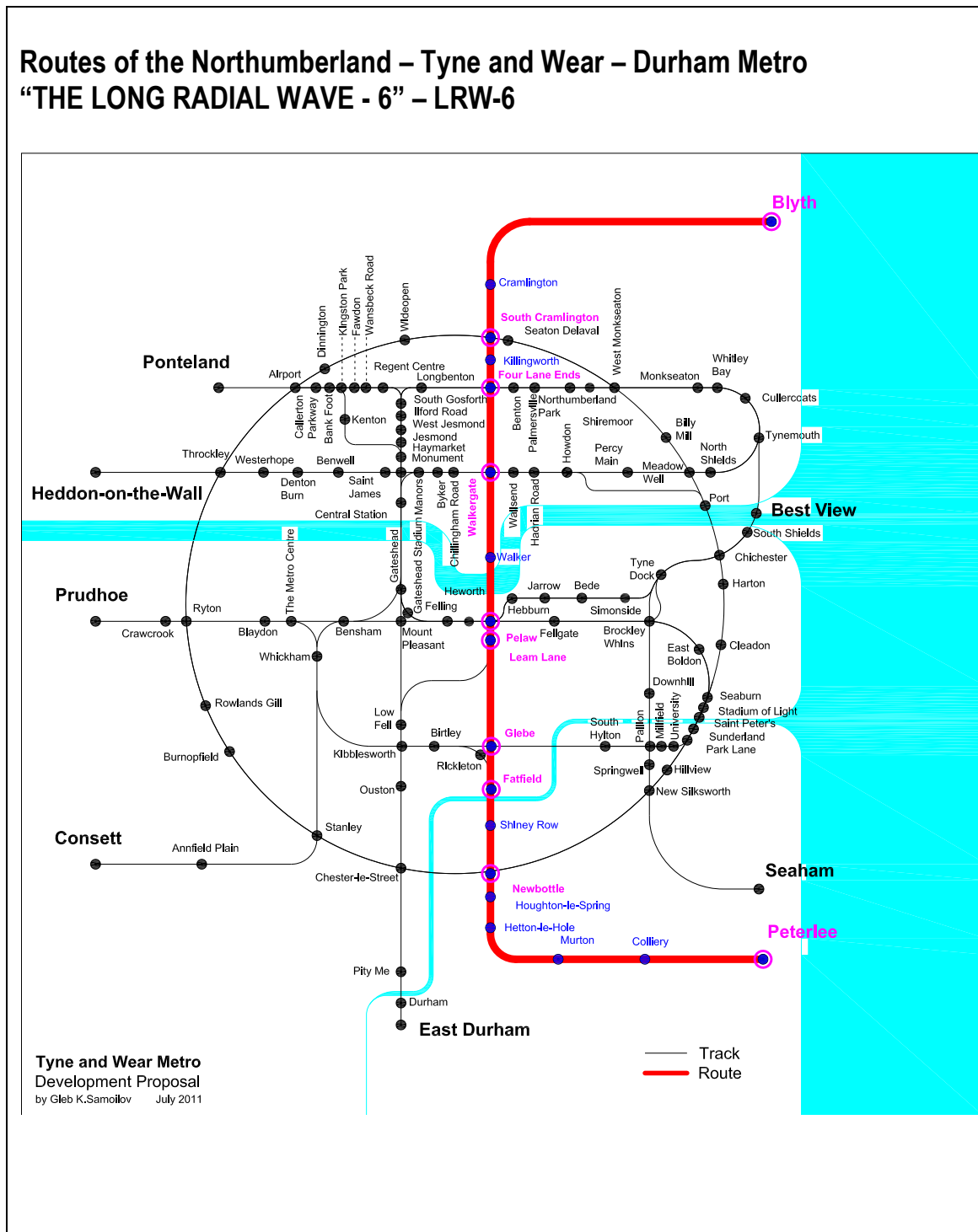


Figure 68.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 6” – LRW-6.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

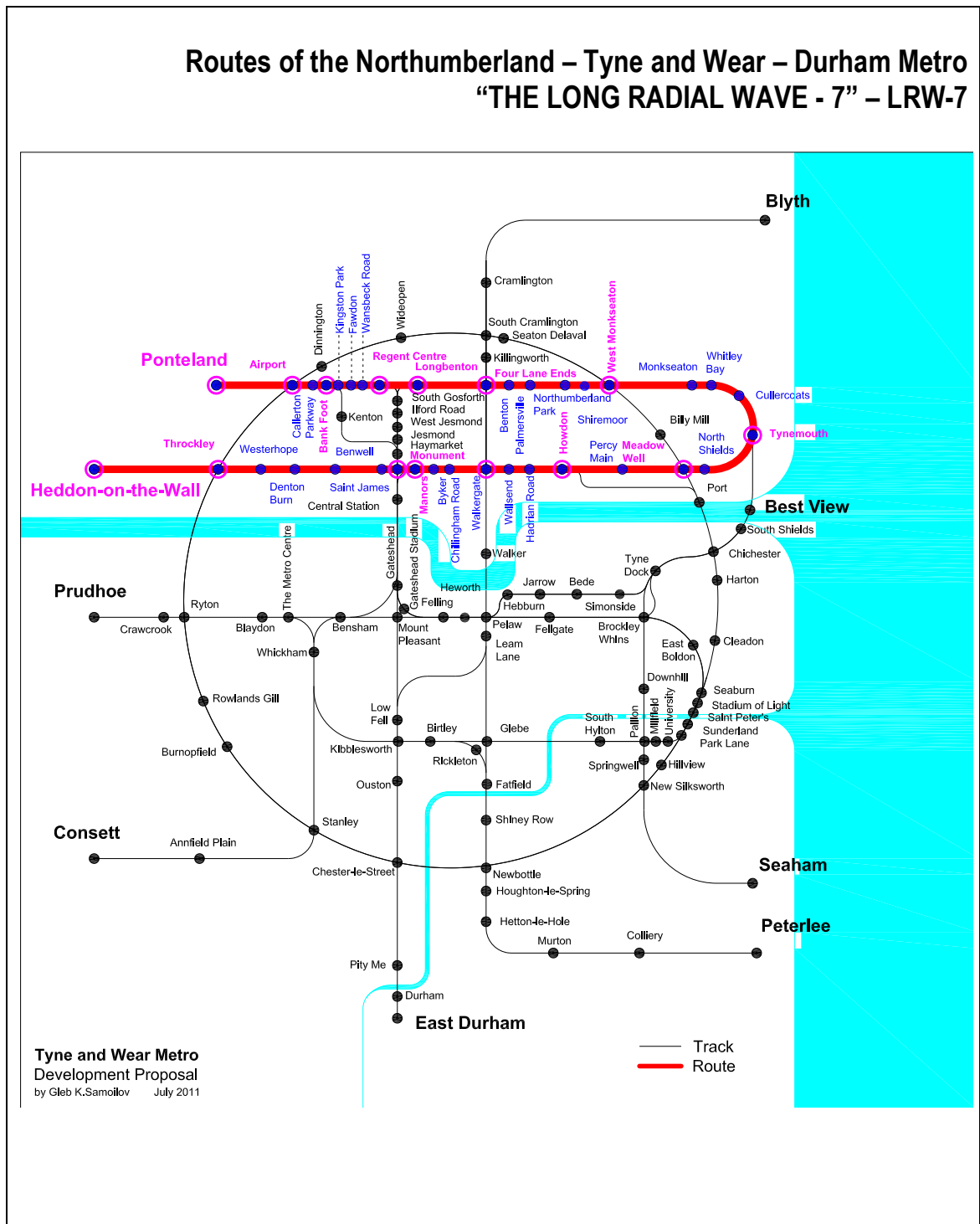


Figure 69.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 7” – LRW-7.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

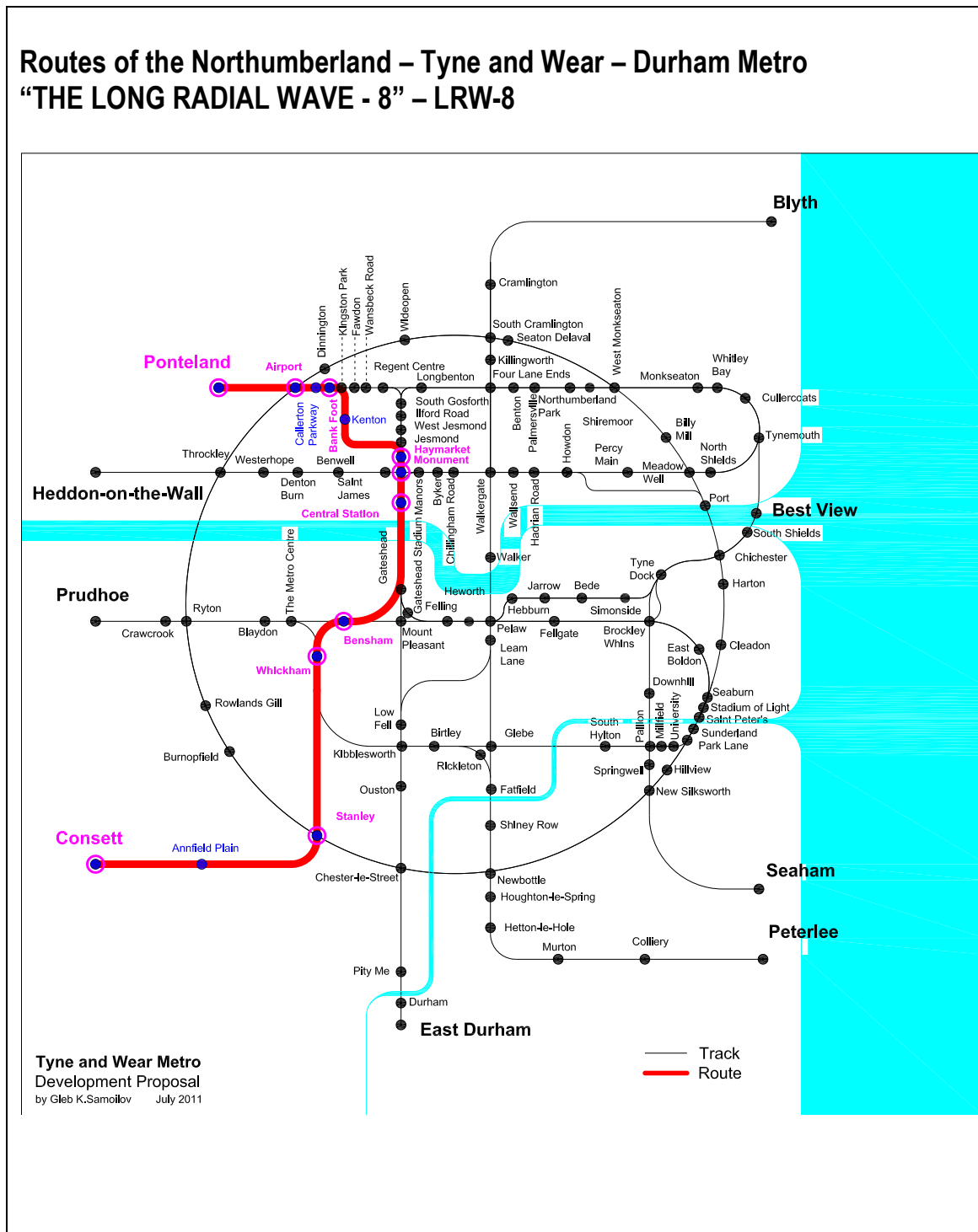


Figure 70.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 8” – LRW-8.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K. Samoilov (July, 2011).

(LRW-8) is demonstrated on the Figure 70.

The Route “THE LONG RADIAL WAVE -9” (LRW-9): *PRUDHOE – RYTON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – SEABURN – BROCKLEY WHINS – PELAW – FELLING – GATESHEAD – CENTRAL STATION – MONUMENT – HAYMARKET – SOUTH GOSFORTH – REGENT CENTRE – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 41 stations (19 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Whickham (the Interchange node), Kibblesworth (the Interchange node), Birtley (the Interchange node), Glebe (the Interchange node), South Hylton, Pallion (the Interchange node), Millfield, University, Park Lane (the Interchange node), Sunderland, Saint Peter's, Stadium of Light, Seaburn (the Interchange node), East Boldon, Brockley Whins (the Interchange node), Fellgate, Pelaw (the Interchange node), Heworth, Felling (the Interchange node), Gateshead Stadium, Gateshead (the Interchange node), Central Stations (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Jesmond, West Jesmond, Ilford Road, South Gosforth (the Interchange node), Regent Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave -9” Route (LRW-9) is demonstrated on the Figure 71.

The Route “THE LONG RADIAL WAVE -10” (LRW-10): *PRUDHOE – RYTON – THE METRO CENTRE – WHICKHAM – KIBBLESWORTH – BIRTLEY – GLEBE – PALLION – PARK LANE – SEABURN – CHICHESTER – PORT – HOWDON – WALKERGATE – MANORS – MONUMENT – THROCKLEY – HEDDON-ON-THE-WALL*.

This Route has 36 stations (15 interchange nodes): Heddton-on-the-Wall (the Initial station / the Final station – conditionally), Throckley (the Interchange node), Westerhope, Denton Burn, Benwell, Saint James, Monument (the Interchange node), Manors (the Interchange node), Byker, Chillingham Road, Walkergate (the Interchange node), Wallsend, Hadrian Road, Howdon (the Interchange node), Port (the Interchange node), Chichester (the Interchange node), Harton, Cleadon, Seaburn (the Interchange node), Stadium of Light, Saint Peter's, Sunderland, Park Lane (the Interchange node), University, Millfield, Pallion (the Interchange node), South Hylton, Glebe (the Interchange node), Birtley (the Interchange node), Kibblesworth (the Interchange node), Whickham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave -10” Route (LRW-10) is demonstrated on the Figure 72.

The Route “THE LONG RADIAL WAVE -11” (LRW-11): *PRUDHOE – THE METRO CENTRE – BENSHAM – MOUNT PLEASANT – FELLING – PELAW – TYNE DOCK – CHICHESTER – SOUTH SHIELDS – TYNEMOUTH – WEST MONKSEATON – FOUR LANE ENDS – LONGBENTON – REGENT CENTRE – AIRPORT – PONTELAND*.

This Route has 37 stations (15 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Bensham (the Interchange node), Mount Pleasant (the Interchange node), Felling (the Interchange node), Heworth, Pelaw (the Interchange node), Hebburn, Jarrow, Bede, Simonside, Tyne Dock (the Interchange node), Chichester (the Interchange node), South Shields, Best View, Tynemouth (the Interchange node), Cullercoats, Whitley Bay, Monkseaton, West Monkseaton (the Interchange node), Shiremoor, Northumberland Park, Palmersville, Benton, Four Lane Ends (the Interchange node), Longbenton (the Interchange node), Regent

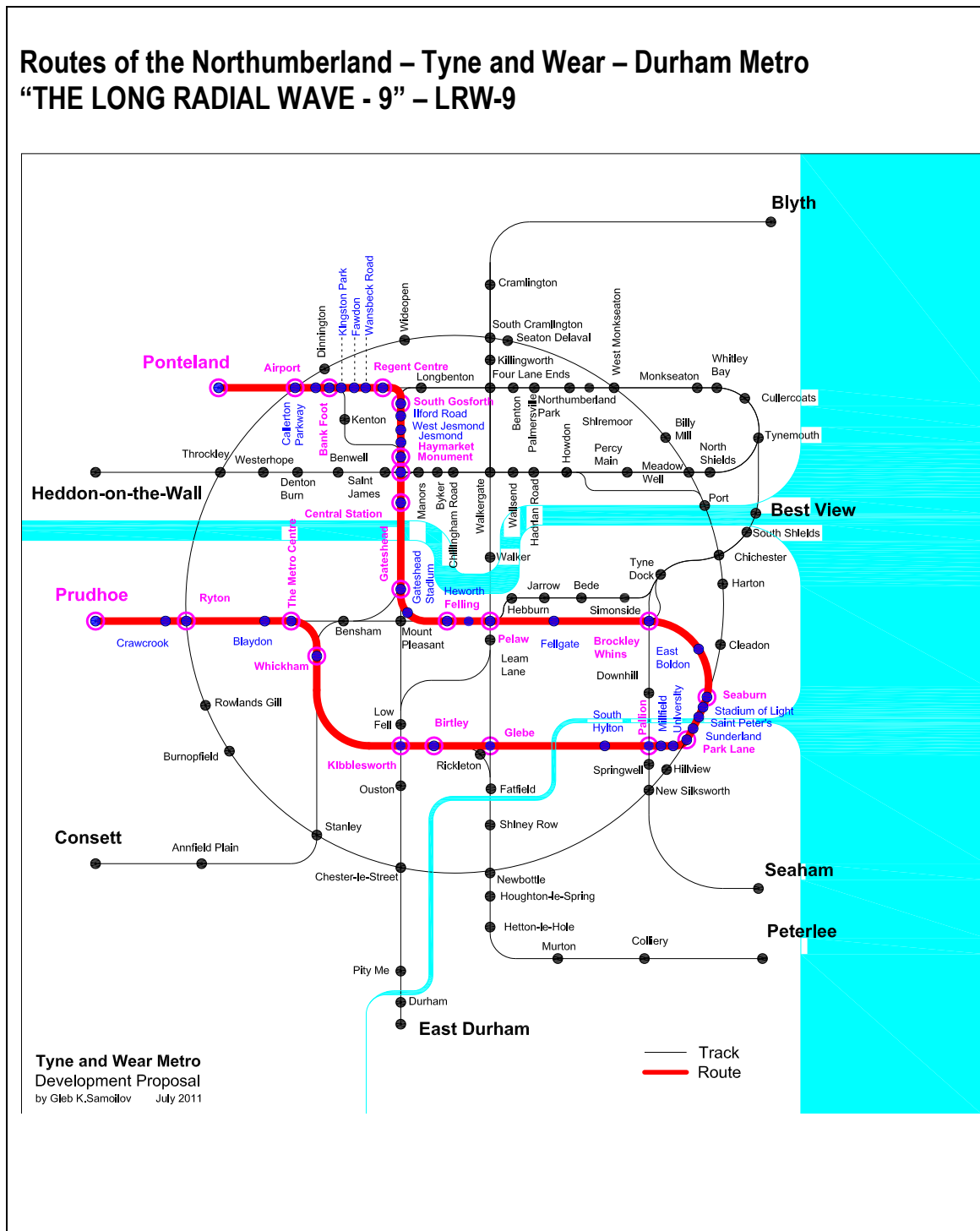


Figure 71.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 9” – LRW-9.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

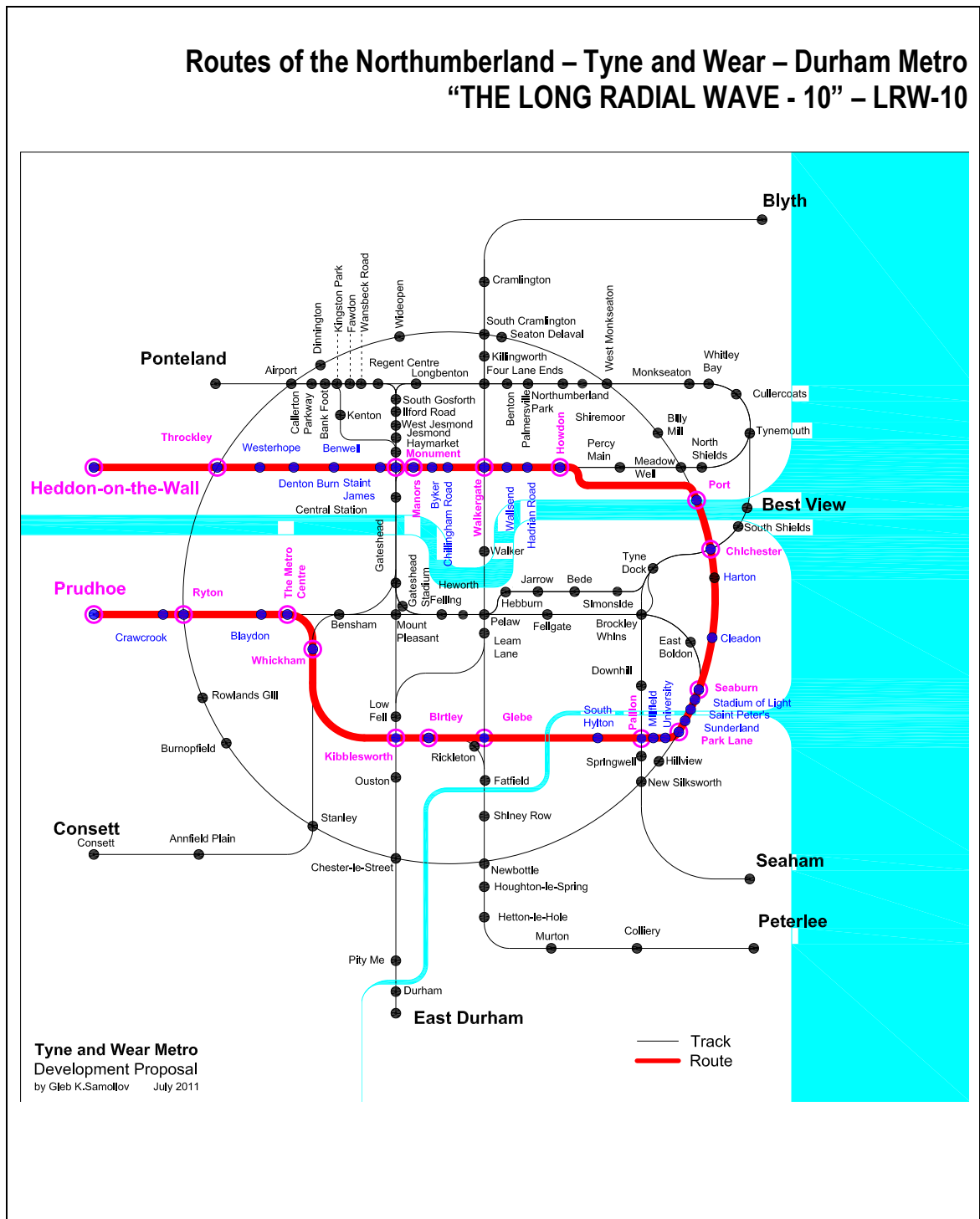


Figure 72.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 10” – LRW-10.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Ieb K.Samoilov (July, 2011).

Routes of the Northumberland – Tyne and Wear – Durham Metro “THE LONG RADIAL WAVE - 11” – LRW-11

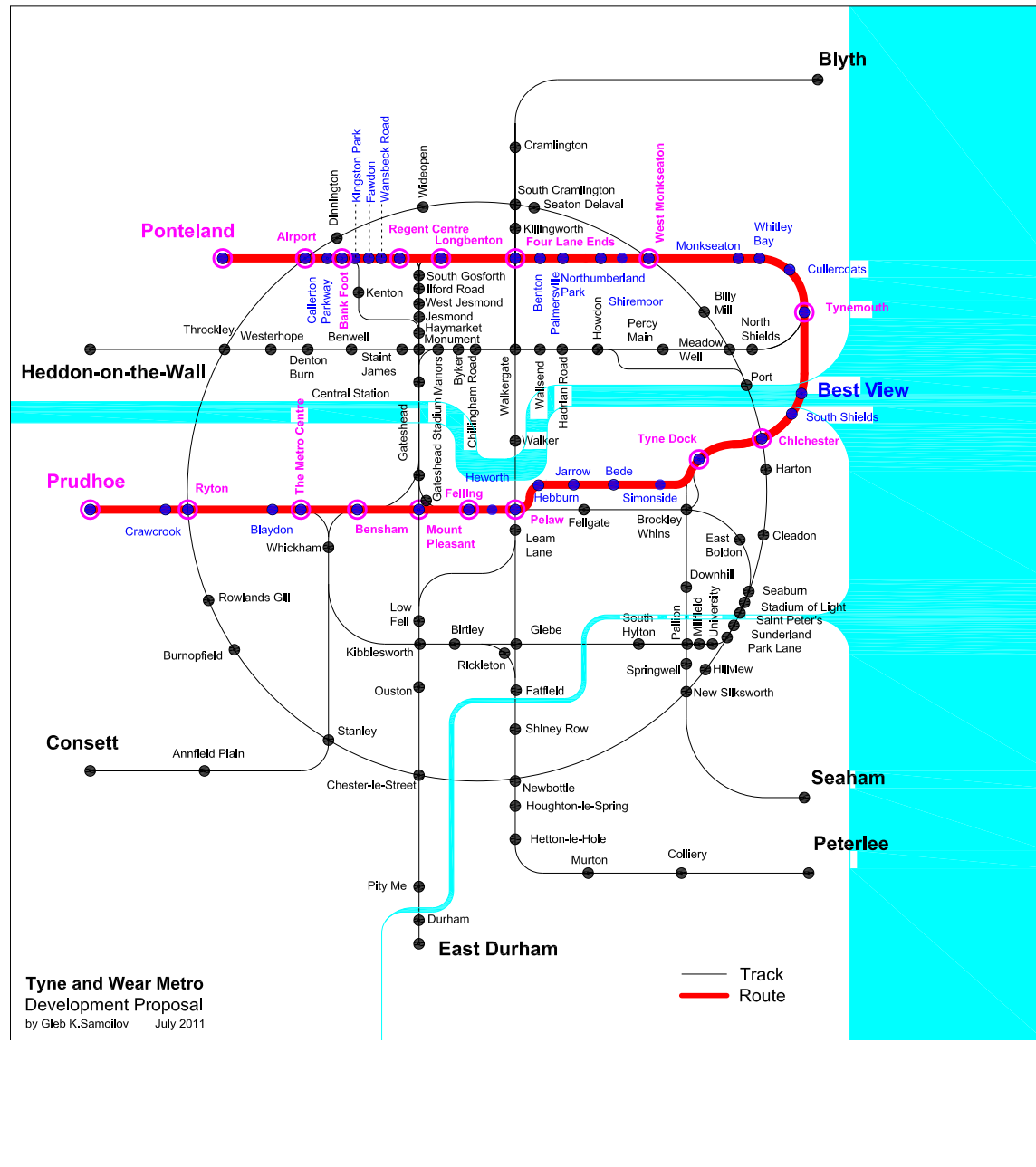


Figure 73.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE LONG RADIAL WAVE - 11” – LRW-11.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

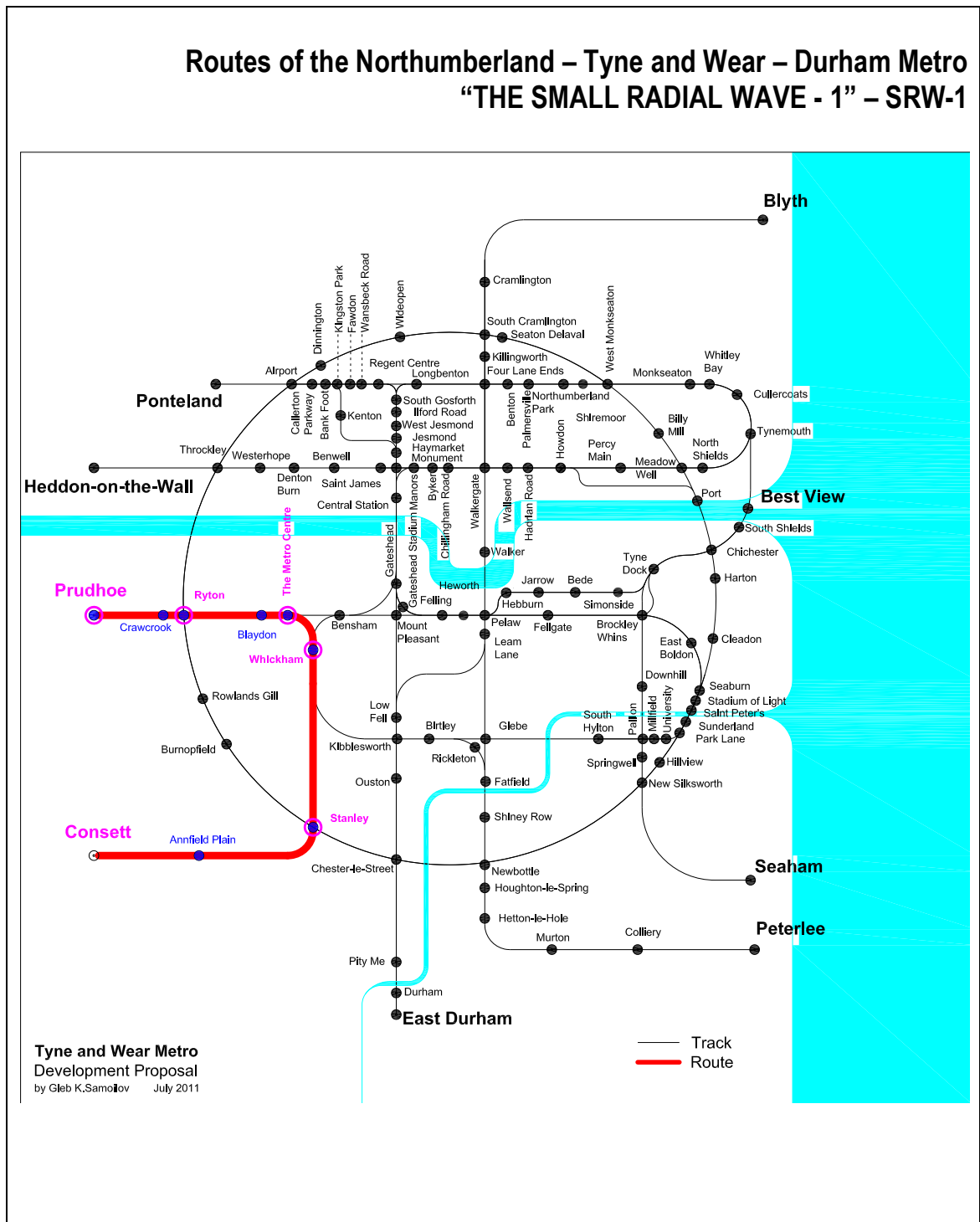


Figure 74.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“THE SMALL RADIAL WAVE - 1” – SRW-1.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

Centre (the Interchange node), Wansbeck Road, Fawdon, Kingston Park, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Long Radial Wave -11” Route (LRW-11) is demonstrated on the Figure 73.

2 Routes of “THE SMALL RADIAL WAVE” (SRW) type.

The Route “THE SMALL RADIAL WAVE -1” (SRW-1): *CONSETT – STANLEY – WHICKHAM – THE METRO CENTRE – RYTON – PRUDHOE*.

This Route has 9 stations (4 interchange nodes): Consett (the Initial station / the Final station – conditionally), Annfield Plain, Stanley (the Interchange node), Whickham (the Interchange node), The Metro Centre (the Interchange node), Blaydon, Ryton (the Interchange node), Crawcrook, Prudhoe (the Initial station / the Final station – conditionally). The scheme of “The Small Radial Wave -1” Route (SRW-1) is demonstrated on the Figure 74.

The Route “THE SMALL RADIAL WAVE -2” (SRW-2): *PRUDHOE – RYTON – THE METRO CENTRE – BENSAM – CENTRAL STATION – MONUMENT – HAYMARKET – KENTON – BANK FOOT – AIRPORT – PONTELAND*.

This Route has 14 stations (8 interchange nodes): Prudhoe (the Initial station / the Final station – conditionally), Crawcrook, Ryton (the Interchange node), Blaydon, The Metro Centre (the Interchange node), Bensham (the Interchange node), Central Station (the Interchange node), Monument (the Interchange node), Haymarket (the Interchange node), Kenton, Bank Foot (the Interchange node), Callerton Parkway, Airport (the Interchange node), Ponteland (the Initial station / the Final station – conditionally). The scheme of “The Small Radial Wave -2” Route (SRW-2) is demonstrated on the Figure 75.

Routes are used in various combinations, depending on time of day, day of week or the season.

4.2 Special and Complex routes of the Metro

Complemented to regular daily routes there are periodic or occasional routes, which are organized to serve the participants of public gatherings in stadiums, racetracks, concert halls, shopping malls, places of public recreation, marine and river embankments, parks, streets and squares. If necessary it is can organize one-time emergency routes.

A separate group is “long” loop-shaped and ring-shaped night routes. They depart once an hour or a half an hour, and allow passengers to serve in such situations as:

- the arrival or the departure with rail stations, airport, port, bus stations;
- the later end of work or leisure activities;
- the early start of work;
- various other situations.

Features of this Ring-radial system allow you to combine multiple routes into one. For example, the four ring routes can be combined:

- “The Grand Ring” (GR) *SUNDERLAND – SOUTH CRAMLINGTON – RYTON – CHESTER-LE-STREET – SUNDERLAND*;
- “The North Tyneside Ring” (NTsR) *SOUTH SHIELDS – WEST MONKSEATON – SOUTH GOSFORTH – PELAW – SOUTH SHIELDS*;
- “The Small Ring” (SR) *PELAW – SEABURN – GLEBE – WHICKHAM – PELAW*;

Routes of the Northumberland – Tyne and Wear – Durham Metro THE NIGHT DUTY ROUTE – THE COMPLEXLY RING ROUTE

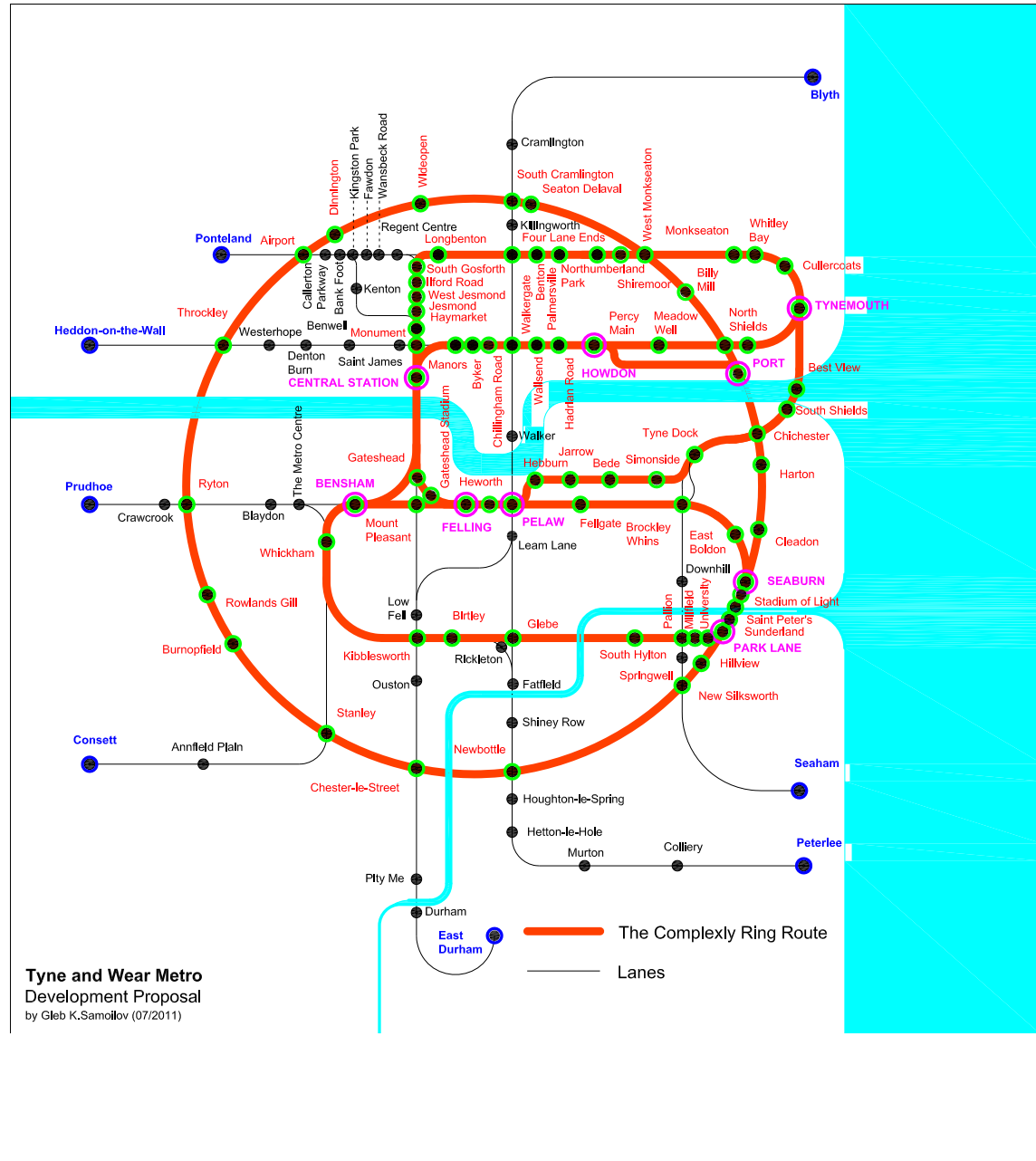


Figure 76.
Routes of the Northumberland – Tyne and Wear – Durham Metro
THE NIGHT DUTY ROUTE – THE COMPLEXLY RING ROUTE.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

- "The South Tyneside Ring" (STsR) *CENTRAL STATION – PORT – GLEBE – WHICKHAM – CENTRAL STATION*.

These Ring routes intersect and overlap, so it is possible to make "The Grand Passage" around the four rings. May can be organized **"THE SUPER ROUTE"**: "The Grand Ring" – **Park Lane** – "The Small Ring" – **Park Lane** – "The South Ring" – **Central Station** – "The North Ring" or in reverse order. The scheme of this Complex Route is shown in Figure 76.

The journey can be started or finished on the Radial line in Seaham or Peterlee, or Consett, or Prudhoe, or Heddon-on-the-Wall, or Ponteland, or East Durham. And from East Durham it is possible to reach Blyth through Pelaw, Wallsend, and Cramlington.

Examples of such routes:

"THE COMPLEX RING" (CR) route: *Glebe – Pallion – Park Lane – Seaburn – Brockley Whins – Pelaw – Felling – Gateshead – Central Station – Manors – Walkergate – Howdon – Meadow Well – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Bensham – Whickham – Kibblesworth – Birtley – Glebe*.

"THE DOUBLE LOOP -1" (DL-1) route: *Prudhoe – Ryton – Blaydon – The Metro Centre – Bensham – Mount Pleasant – Felling – Pelaw – Brockley Whins – Seaburn – Park Lane – Pallion – Glebe – Birtley – Kibblesworth – Whickham – Bensham – Central Station – Monument – Haymarket – South Gosforth – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Best View – South Shields – Chichester – Tyne Dock – Pelaw – Felling – Mount Pleasant – Bensham – The Metro Centre – Ryton – Prudhoe*.

"THE DOUBLE LOOP -2" (DL-2) route: *Heddon-on-the-Wall – Throckley – Monument – Walkergate – Howdon – Meadow Well – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Bensham – Whickham – Kibblesworth – Birtley – Glebe – Pallion – Park Lane – Seaburn – Chichester – Port – Howdon – Walkergate – Monument – Throckley – Heddon-on-the-Wall*.

"THE DOUBLE LOOP -3" (DL-3) route: *Ponteland – Airport – Bank Foot – Regent Centre – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Meadow Well – Howdon – Walkergate – Manors – Central Station – Gateshead – Felling – Pelaw – Brockley Whins – Seaburn – Park Lane – Pallion – Glebe – Birtley – Kibblesworth – Whickham – Bensham – Central Station – Monument – Haymarket – Kenton – Bank Foot – Airport – Ponteland*.

"THE COMPLEX LOOP -1" (CL-1) route: *Ponteland – Airport – Regent Centre – South Gosforth – Haymarket – Monument – Central Station – Gateshead – Felling – Pelaw – Brockley Whins – Seaburn – Park Lane – Pallion – Glebe – Birtley – Kibblesworth – Whickham – Bensham – Central Station – Monument – Haymarket – South Gosforth – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Best View – Chichester – Tyne Dock – Brockley Whins – Pallion – New Silksworth – Seaham*.

"THE COMPLEX LOOP -2" (CL-2) route: *Prudhoe – Ryton – The Metro Centre – Whickham – Kibblesworth – Birtley – Glebe – Pallion – Park Lane – Seaburn – Brockley Whins – Pelaw – Felling – Gateshead – Central Station – Monument – Haymarket – South Gosforth – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Best View – Chichester – Tyne Dock – Jarrow – Pelaw – Leam Lane – Glebe – Newbottle – Peterlee*.

"THE COMPLEX LOOP -3" (CL-3) route: *East Durham – Chester-le-Street – Kibblesworth – Low Fell – Leam Lane – Pelaw – Tyne Dock – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Gateshead – Felling – Pelaw – Brockley Whins – Seaburn – Park Lane – Pallion – Glebe – Birtley – Kibblesworth – Whickham – Bensham – Central Station – Monument – Haymarket – Kenton – Bank Foot – Airport – Ponteland*.

“THE GRAND LOOP” (GL) route: *Peterlee – Houghton-le-Spring – Newbottle – Fatfield – Glebe – Pelaw – Tyne Dock – Chichester – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Bensham – Whickham – Kibblesworth – Birtley – Glebe – Pallion – Park Lane – Seaburn – Brockley Whins – Pelaw – Felling – Gateshead – Central Station – Manors – Walkergate – Howdon – Port – Chichester – Seaburn – Park Lane – New Silksworth – Newbottle – Chester-le-Street – Stanley – Ryton – Throckley – Airport – Dinnington – South Cramlington – West Monkseaton – North Shields – Port – Chichester – Seaburn – Park Lane – Pallion – Glebe – Birtley – Kibblesworth – Whickham – Bensham – Central Station – Monument – Haymarket – South Gosforth – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Chichester – Tyne Dock – Pelaw – Glebe – Fatfield – Newbottle – Hetton-le-Hole – Easington Colliery – Peterlee*.

The proposed scheme of lines with deadlock section and detour sections at most stations can organize the Stable Day-and-Night work of the Tyne and Wear Metro. Developed network of routes allows you to organize the delivery of small packages and mail.

4.3 The Improvement of Barrier-free Environment at the expense of the Metro routing

In the extensive network of the Tyne and Wear Metro to be implemented a set of measures to create of the Barrier-free environment. It includes commonly occurring events, used in many subways like the United Kingdom and around the World.

Tyne and Wear Metro is being made more accessible for people with disabilities and to comply with the provisions of the Commonwealth Government's Disability Discrimination Act (1992) and the Disability Standards for Accessible Public Transport (2002). There are specific measures that reflect the features of a developed network of Tyne and Wear Metro.

Commonly occurring events [110, 111, 112, 113, 114, 115, 241, 297, 464] help to create barrier-free environment in the areas of land or ground pavement to the underground Metro station platform, easy entry and exit from the train wagon, convenience inside the train wagon. Comprehensively applied to passive and active methods.

The passive methods include:

- ramps;
- lifts;
- platform lifts for flights of stairs;
- handrails along all the walls;
- stairs to the size of steps, standards compliant barrier-free environment;
- sound, color and light accent, floor with tactile coating developed in the areas to change direction, start or finish up or down the ramp in front of elevator or escalator, the band platform security station, in front of turnstiles and special portals at the Anteroom station entrance and exit;
- the developed system of sound, color and light pointers itinerary and movements within the complex premises Metro station, standards compliant barrier-free environment;
- portals for audiovisual consulting passengers (on the Anteroom and on the platforms of stations;
- public toilets with easy access directly from the platform of the station;
- station platforms that have the same level with the floor train wagon;
- the place to turn and lock wheelchair inside the train wagon.

The active methods include:

- the system of sound and light signals in Anteroom at the entrance and exit of the station platforms, escalators, elevators, in train wagons;

- Metro officer for meeting and escort of the passenger from the entrance before entering the train wagon;
- Metro officer for meeting and escort the passenger from leaving the train wagon to the exit;
- Provision of wheelchairs and the allocation of staff to accompany a passenger inside the Metro complex (ENTRANCE – TRAVEL – EXIT);
- A permanent presence on every Platform and Anteroom Metro officer, who can provide advice to the passenger;
- Providing an individual gadget with the function of individual audio-visual guide to the Metro system for a metro trip;
- Help for passengers with guide-dogs.

A feature of the proposed scheme of the Tyne and Wear Metro, forming a ring-radial network, is the ability to organize routes, which provide connection between any two stations without interchanges. This, of course, increases the movement, but to minimize the inconvenience suffered by passengers, when transplanted from one train to another, overcoming the corridors, ramps, elevators and escalators at the interchange nodes.

An example of such route: travel from the Station “East Durham” to the Station “Haddon-on-the-Wall”. Normal, the “Short route”: *East Durham, Durham, Pity Me, Chester-le-Street (Radial), * TRANSFER *, Chester-le-Street (Ring), Stanley, Burnopfield, Rowlands Gill, Ryton, Throckley (Ring), * TRANSFER *, Throckley (Radial), Heddton-on-the-Wall*. This route passes through 10 stations, and implies two transfers with the use of escalators or elevators. Its length is 24.5 km / 14.91 miles. **Even if you have a maintainer for passengers with disabilities serial input and output in three trains, performed twice to transfer from one line to another, using elevators or escalators, creates obvious technical and psychological discomfort.**

There is another, “Average route”: *East Durham, Durham, Pity Me, Chester-le-Street, Ouston, Kibblesworth, Low Fell, Mount Pleasant, Gateshead, Central Station, Monument, * TRANSFER *, Monument, Saint James, Benwell, Denton Burn, Westerhope, Throckley, Heddton-on-the-Wall*. This route passes through 17 stations. Its length is 27.0 km / 16.78 miles. The route involves one transfer. This transfer performed at the same station “Monument” in another train.

Alternatively, you can use the “Long route” – the Small Loop -5: *East Durham, Durham, Pity Me, Chester-le-Street, Ouston, Kibblesworth, Low Fell, Mount Pleasant, Gateshead, Central Station, Monument, Haymarket, Jesmond, West Jesmond, Ilford Road, South Gosforth, Longbenton, Four Lane Ends, Benton, Palmersville, Northumberland Park, Shiremoor, West Monkseaton, Monkseaton, Whitley Bay, Cullercoats, Tynemouth, North Shields, Meadow Well, Percy Main, Howdon, Hadrian Road, Wallsend, Walkergate, Chillingham Road, Byker, Manors, Monument, Saint James, Benwell, Denton Burn, Westerhope, Throckley, Heddton-on-the-Wall*. This route passes through 44 stations. Its length is 46.0 km / 28.58 miles. It takes about one and a half times as long. But on this route there is no transfer which **minimizes the technical and psychological discomfort.**

Travel options from the Station “East Durham” to the Station “Haddon-on-the-Wall” are shown in Figure 77.

As examples of other “long” non-stop routes can be reduced as follows:

- **the Route “THE SMALL LOOP -3” (SL-3):** *Heddton-on-the-Wall – Throckley – Saint James – Monument – Walkergate – Howdon – Meadow Well – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Gateshead – Felling – Pelaw – Tyne Dock – Chichester*;
- **the Route “THE SMALL LOOP -7” (SL-7):** *East Durham – Chester-le-Street – Kibblesworth – Low Fell – Mount Pleasant – Gateshead – Central Station – Manors –

Routes of the Northumberland – Tyne and Wear – Durham Metro “EAST DURHAM / HEDDON-ON-THE-WALL” travel options

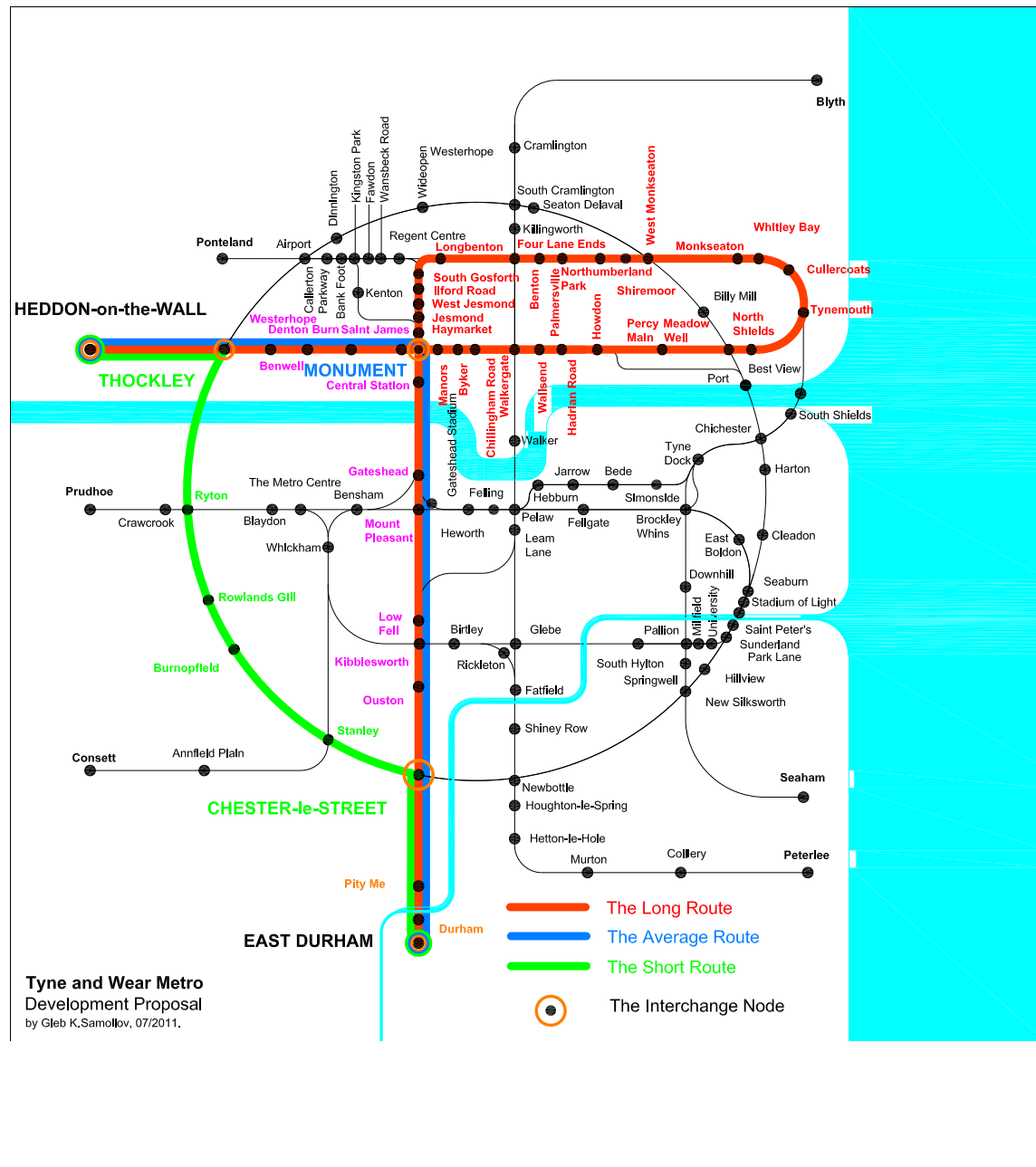


Figure 77.
Routes of the Northumberland – Tyne and Wear – Durham Metro
“EAST DURHAM / HEDDON-ON-THE-WALL” travel options.

Images source:

Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

- Walkergate – Howdon – Meadow Well – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Bensham – The Metro Centre – Ryton – Prudhoe*;
- **the Route “THE SMALL LOOP -8”** (SL-8): *Heddon-on-the-Wall – Throckley – Saint James – Monument – Walkergate – Howdon – Meadow Well – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Bensham – Whickham – Stanley – Consett*;
- **the Route “The BIG WAVE -1”** (BW-1): *Consett – Stanley – Whickham – Bensham – Central Station – Monument – Haymarket – South Gosforth – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Chichester – Tyne Dock – Brockley Whins – Pallion – New Silksworth – Seaham*;
- **the Route “THE BIG WAVE -4”** (BW-4): *East Durham – Chester-le-Street – Kibblesworth – Low Fell – Mount Pleasant – Gateshead – Central Station – Monument – Haymarket – South Gosforth – Longbenton – Four Lane Ends – West Monkseaton – Tynemouth – Chichester – Tyne Dock – Brockley Whins – Pallion – New Silksworth – Seaham*;
- **the Route “THE BIG WAVE -5”** (BW-5): *Seaham – New Silksworth – Pallion – Brockley Whins – Tyne Dock – Chichester – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – South Gosforth – Haymarket – Monument – Central Station – Bensham – The Metro Centre – Ryton – Prudhoe*;
- **the Route “THE BIG WAVE -10”** (BW-10): *Peterlee – Newbottle – Fatfield – Fatfield – Glebe – Leam Lane – Pelaw – Tyne Dock – Chichester – Tynemouth – West Monkseaton – Four Lane Ends – Longbenton – Regent Centre – Airport – Ponteland*.

The organization of this type is suitable routes every half hour in rush hour and every three quarters of an hour or an hour at other times (depending on the actual traffic flow). On the audio-visual displays, advising passengers on the route definition provides information on alternative options:

- “The Short Route” (the scheme of the Route with the release of the Initial station, the Final station, interchange nodes, travel time, timetable of train on this Route for a period of time, time to nearest train arrival at the platform);

- “The Average Route” (the scheme of the Route with the release of the Initial station, the Final station, interchange nodes, travel time, timetable of train on this Route for a period of time, time to nearest train arrival at the platform);

- “The Long Route” (the scheme of the Route with the release of the Initial station, the Final station, travel time, timetable of train on this Route for a period of time, time to nearest train arrival at the platform).

On separate stands shown daily schedule of “long routes” with the release of trains arriving at the station in the next half hour. This schedule is published on the websites of the Metro operating company. It also applies in the form of free brochures.

Thus, a set of passive and active measures, supplemented by a group through routes will form a complete barrier-free environment, providing maximum convenience and availability of advanced network Tyne & Wear Metro.

Conclusions of the Fourth chapter

Held in the Fourth chapter analysis led to the following conclusions:

1. The existing Metro operates two routes out of four possible routes.

2. Development of the Metro network allows you to organize dozens of different routes. Existing routes are an integral part of the new route network.
3. These routes are of different length. The configuration of these routes is as follows: Ring-shaped (2 types, 9 routes: 5 Routes of "THE RING" type; 4 Routes of "THE DOUBLE RING" type), loop-shaped (5 types, 32 routes: 1+6 Routes of "THE GRAND LOOP" type; 3 Routes of "THE DOUBLE LOOP" type; 3+3 Routes of "THE COMPLEX LOOP" type; 7 Routes of "THE BIG LOOP" type; 9 Routes of "THE SMALL LOOP" type) and wave-shaped (3 types, 24 route: 11 Routes of "THE BIG WAVE" type; 11 Routes of "THE LONG RADIAL WAVE" type; 2 Routes of "THE SMALL RADIAL WAVE" type).
4. The route network ensures stable operation of the Metro. Carrying out repairs or maintenance on any part of the extensive network of the Metro is minimal inconvenience to passengers. The developed route network makes it possible to travel by alternative routes.
5. The presence of multiple routes allows you to adjust the composition of the traffic network, depending on time of day. There may be the best replacement routes.
6. The developed route network of the Metro allows you to organize the delivery of small packages and mail on the optimal route.
7. Ring-and loop-shaped routes are most appropriate for passenger transport. For combined transport (passengers + small loads) should be Wave-shaped routes.
8. Integrated loop-shaped ring-shaped and can arrange tours optimum performance the Metro on weekends and holidays, as well as at night.
9. Availability of alternative routes can improve usability of the Metro for disabilities. The main disadvantages are associated with the need of Interchange from one to another (stairs, escalators, motion in a dense flow of passengers). Choice of route no transfers can solve this problem. Greater travel time is compensated by the lack of technical and psychological discomfort for the Interchange.

Chapter 5

THE CREATION OF THE INTEGRATED SCHEME OF PUBLIC AND PRIVATE TRANSPORT OF THE TYNE AND WEAR CONURBATION

5.1 The Metro Integration with other modes of Public Transport

Conducted in the late Twentieth century deregulation of Bus services in some way reduced the potential of the Metro for the Integration. However, the phasing network Northumberland – Tyne and Wear – Durham Metro will make the system more sustainable integrated transport for possible changes.

Currently, Bus service in the Tyne and Wear Conurbation have the multi-beam scheme. On most streets in organized bus traffic. In the Central part of each administrative unit is bus station, on which most of the routes converge. At Bus stations are large shopping centers, catering.

In Central parts of administrative units formed by a large accumulation of routes, overloading the roadway. Expansion of the roadway of the streets in these areas is impossible, since, firstly, they are surrounded by historically valuable buildings, unliable demolition, and, secondly, due to the expansion of the carriageway deteriorating condition of its intersection by pedestrians, who move the pendulum from one shopping center to another.

Removal of Shopping centers and Railway stations from the Central parts of administrative units at this stage of sintering is not appropriate, as in the Central parts are not yet formed, and in a number of Administrative units and can not be formed, major Business centers, cultural and entertainment facilities and tourist attraction, which can take on the role of City-forming center. A denial of these centers of trade and transport functions in the foreseeable future will lead to the loss of their commercial appeal.

Part of passengers, not interested in moving to the Center is unable to drive, bypassing it. The road through the center creates objectively unnatural seal of passenger traffic, lengthening journey times and more expensive trips.

Many passengers seeking to central spend a lot of travel time as needed to use the usual routes with frequent, convenient only to some passengers, stops.

The solution most of the problems can be as follows:

- The organization of Bus routes only to the nearest Metro station;
- The eliminate duplication of bus routes Metro lines.
- Organization of several Cross-chord routes that will allow reallocation of passenger traffic, bypassing the facility;
- Organization of radial and chordates express routes;
- Organization of "Short routes" from one station to another on the opposite side of the Metro-line.
- Organization departmental (for a single group of companies) routes for faster and more comfortable delivery staff in offices and businesses, which will partially reduce the need to use their personal vehicles.

The INTEGRATED PUBLIC TRANSPORT SYSTEM is the result of the link between transit Rail service, Airport, Seaport and intercity Bus service (external transport) with the Developed network of Metro, Bus services and Taxi service (internal transport). Contact stations of Transit rail transport and Internal transport determined on the basis of Country's and Regional development Railways, Airline, Ferry line and Bus routes schemes.

The Integrated System of Internal and External Public Transport of Tyne and Wear Conurbation, formed by NORTHUMBERLAND – TYNE and WEAR – DURHAM METRO (117 points), looks like this.

Integrated points of Metro with External Transport and Bus service.

The Integrated system of Metro with External Transport and Bus service includes the following types of contacts: AIR TERMINAL + MARINE STATION + RAILWAY STATION + BUS STATION + BUS STOP + METRO STATION. Different combinations of contacts form six types of Integration nodes and one type of Non-integration unit.

Main Integrated nodes for Bus service with Metro (13 points):

- **Air terminal + Metro station + Bus station (1 point):** NEWCASTLE AIRPORT;
- **Marine station + Metro station + Bus station (1 point):** PORT;
- **Railway station + Metro station + Bus station (3 points):** DURHAM, SEAHAM, PRUDHOE;
- **Railway station + Metro station + Bus stop (8 points):** NEWCASTLE CENTRAL STATION, MANORS, CRAMLINGTON, CHESTER-LE-STREET, SUNDERLAND, HEWORTH, THE METRO CENTRE, BLAYDON;

Average Integrated nodes for Bus service with Metro (5 points):

- **Metro station + Bus station (5 points):** PETERLEE, CONSETT, HEDDON-ON-THE-WALL, BLYTH, HAYMARKET.

Ordinary Integrated nodes for Bus service with Metro (98 points):

- **Metro station + Bus stop (98 points):** PARK LANE, HILLVIEW, NEW SILKSWORTH, NEWBOTTLE, STANLEY, BURNOPFIELD, ROWLANDS GILL, RYTON, THROCKLEY, DINNINGTON, WIDEOPEN, SOUTH CRAMLINGTON, SEATON DELAVAL, WEST MONKSEATON, BILLY MILL, MEADOW WELL, CHICHESTER, HARTON, CLEADON, SEABURN, STADIUM OF LIGHT, SAINT PETER'S, COLLIERY, MURTON, HETTON-LE-HOLE, HOUGHTON-LE-SPRING, SHINEY ROW, FATFIELD, GLEBE, LEAM LANE, PELAW, WALKER, WALKERGATE, FOUR LANE ENDS, KILLINGWORTH, EAST DURHAM, PITY ME, OUSTON, KIBBLESWORTH, LOW FELL, MOUNT PLEASANT, MONUMENT, JESMOND, WEST JESMOND, ILFORD ROAD, SOUTH GOSFORTH, REGENT CENTRE, WANSBECK ROAD, FAWDON, KINGSTON PARK, BANK FOOT, CALLERTON PARKWAY, PONTELAND, KENTON, WESTERHOPE, DENTON BURN, BENWELL, SAINT JAMES, BYKER, CHILLINGHAM ROAD, WALLSEND, HADRIAN ROAD, HOWDON, PERCY MAIN, NORTH SHIELDS, TYNEMOUTH, CULLERCOATS, WHITLEY BAY, MONKSEATON, SHIREMOOR, NORTHUMBERLAND PARK, PALMERSVILLE, BENTON, LONGBENTON, BENSHAM, WHICKHAM, ANNFIELD PLAIN, CRAWCROOK, BIRTLEY, RICKLETON, SOUTH HYLTON, PALLION, MILLFIELD, UNIVERSITY, EAST BOLDON, BROCKLEY WHINS, FELLGATE, FELLING, GATESHEAD STADIUM, GATESHEAD, HEBBURN, JARROW, BEDE, SIMONSDALE, TYNE DOCK, SOUTH SHIELDS, DOWNHILL, SPRINGWELL.

Non-integrated units for Bus service with Metro (1 point):

- **Metro station (1 point):** BEST VIEW on the New Bridge.

Integrated points of Metro with External Transport and Bus service shown in the Figure 78.

The Integrated system of Metro with Taxi service includes the following types of contacts: AIR TERMINAL + MARINE STATION + RAILWAY STATION + TAXI HUB + TAXI STOP + METRO STATION. Different combinations of contacts form six types of Integration nodes and

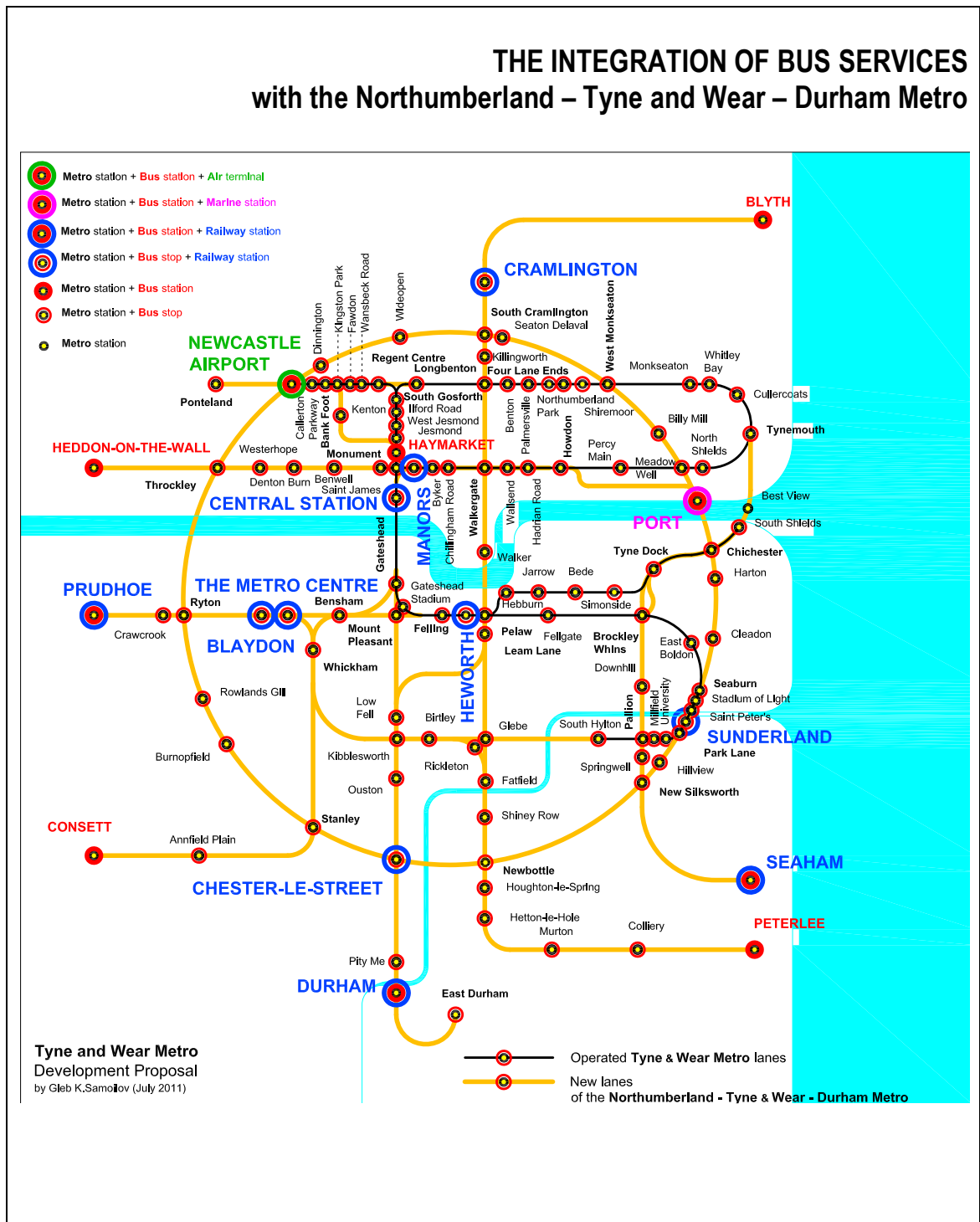


Figure 78.
THE INTEGRATION OF BUS SERVICES
with the Northumberland – Tyne and Wear – Durham Metro.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

one type of Non-integration unit.

Main Integrated nodes for Taxi service with Metro:

- **Air terminal + Metro station + Taxi hub (1 point):** NEWCASTLE AIRPORT;
- **Marine station + Metro station + Taxi Hub (1 point):** PORT;
- **Railway station + Metro station + Taxi hub (7 points):** DURHAM, SEAHAM, SUNDERLAND, THE METRO CENTRE, PRUDHOE, NEWCASTLE CENTRAL STATION, CRAMLINGTON;
- **Railway station + Metro station + Taxi stop (4 points):** MANORS, CHESTER-LE-STREET, HEWORTH, BLAYDON;

Average Integrated nodes for Taxi service with Metro:

- **Metro station + Taxi hub (16 points):** PETERLEE, HOUGHTON-LE-SPRING, CONSETT, LOW FELL, GLEBE, PELAW, STADIUM OF LIGHT, GATESHEAD STADIUM, SOUTH SHIELDS, SAINT JAMES, HAYMARKET, HEDDON-ON-THE-WALL, TYNEMOUTH, NORTHUMBERLAND PARK, REGENT CENTRE, BLYTH;

Ordinary Integrated nodes for Taxi service with Metro:

- **Metro station + Taxi stop (88 points):** PARK LANE, HILLVIEW, NEW SILKSWORTH, NEWBOTTLE, STANLEY, BURNOPFIELD, ROWLANDS GILL, RYTON, THROCKLEY, DINNINGTON, WIDEOPEN, SOUTH CRAMLINGTON, SEATON DELAVAL, WEST MONKSEATON, BILLY MILL, MEADOW WELL, CHICHESTER, HARTON, CLEADON, SEABURN, SAINT PETER'S, COLLIERY, MURTON, HETTON-LE-HOLE, SHINEY ROW, FATFIELD, LEAM LANE, WALKER, WALKERGATE, FOUR LANE ENDS, KILLINGWORTH, EAST DURHAM, PITY ME, OUSTON, KIBBLESWORTH, MOUNT PLEASANT, JESMOND, WEST JESMOND, ILFORD ROAD, SOUTH GOSFORTH, WANSBECK ROAD, FAWDON, KINGSTON PARK, BANK FOOT, CALLERTON PARKWAY, PONTELAND, KENTON, WESTERHOPE, DENTON BURN, BENWELL, SAINT JAMES, BYKER, CHILLINGHAM ROAD, WALLSEND, HADRIAN ROAD, HOWDON, PERCY MAIN, NORTH SHIELDS, CULLERCOATS, WHITLEY BAY, MONKSEATON, SHIREMOOR, PALMERSVILLE, BENTON, LONGBENTON, BENSHAM, WHICKHAM, ANNFIELD PLAIN, CRAWCROOK, BIRTLEY, RICKLETON, SOUTH HYLTON, PALLION, MILLFIELD, UNIVERSITY, EAST BOLDON, BROCKLEY WHINS, FELLGATE, FELLING, GATESHEAD, HEBBURN, JARROW, BEDE, SIMONSIDE, TYNE DOCK, DOWNHILL, SPRINGWELL;

Non-integrated units for Taxi service with Metro:

- **Metro station (2 point):** MONUMENT, BEST VIEW on the New Bridge.

Integrated points of Metro with Taxi service shown in the Figure 79.

5.2 The Metro Integration with Private transport

Developed network of parking at Metro stations serves as the Parking and Ride. This reduces the time required to travel as well as advanced Metro network allows faster and easier to navigate within the network.

This has implications for episodic and periodic movements of the pendulum. In this case the Central part of the movement is on the Metro, with subsequent lease or personal use of the Scooter or the Bicycle, and on the periphery – in his or leased vehicle (the Car, the Scooter, the Motorcycle, the Bicycle).

For cross-cutting (diametrical or chord) movement has developed the Value System of Rental Vehicles. In this case the Central part of the movement is on the Metro, and on the

periphery (to the Metro station or from the Metro station) – on his or leased vehicle (the Car, the Scooter, the Motorcycle, the Bicycle).

The Integrated system of Public and Private Transport includes the following types of contacts: AIR TERMINAL + MARINE STATION + RAILWAY STATION + MULTILEVEL CAR SMART PARKING (underground and surface) + COVERED CAR PARKING + EXISTING CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING (underground and surface) + METRO STATION. Different combinations of contacts form six types of Integration nodes and one type of Non-integration unit.

Main Integrated nodes for Private Transport with Metro:

- **Metro station + Bicycle & Scooter Smart-parking + Surface Car parking + Multilevel Car Smart-parking (11 points):** NEWCASTLE AIRPORT, CENTRAL STATION, CRAMLINGTON, PORT, TYNE DOCK, THE METRO CENTRE, MOUNT PLEASANT, GLEBE, SUNDERLAND, SEAHAM, DURHAM;
- **Metro station + Bicycle & Scooter Smart-parking + Existing Car parking + Multilevel Car Smart-parking (1 point):** HEWORTH.

Average Integrated nodes for Private Transport with Metro:

- **Metro station + Bicycle & Scooter Smart-parking + Surface Car parking + Covered Car parking (19 points):** BLYTH, SOUTH CRAMLINGTON, SHIREMOOR, WEST MONKSEATON, WHITLEY BAY, TYNEMOUTH, WALKERGATE, THROCKLEY, PRUDHOE, RYTON, GATESHEAD STADIUM, PARK LANE, NEW SILKSWORTH, PETRELEE, HETTON-LE-HOLE, NEWBOTTLE, CHESTER-LE-STREET, STANLEY, CONSETT;
- **Metro station + Bicycle & Scooter Smart-parking + Existing Car parking (13 points):** CALLERTON PARKWAY, BANK FOOT, KINGSTON PARK, REGENT CENTRE, HAYMARKET, SAINT JAMES, FOUR LANE ENDS, NORTHUMBERLAND PARK, NORTH SHIELDS, GATESHEAD, FELLGATE, EAST BOLDON, STADIUM OF LIGHT.

Ordinary Integrated nodes for Private Transport with Metro:

- **Metro station + Bicycle & Scooter Smart-parking + Surface Car parking (69 points):** DINNINGTON, WIDEOPEN, SEATON DELAVAL, BILLY MILL, MEADOW WELL, CHICHESTER, HARTON, CLEADON, SEABURN, SAINT PETER'S, HILLVIEW, BURNOPFIELD, ROWLANDS GILL, PONTELAND, HEDDON-ON-THE-WALL, CRAWCROOCK, ANNFIELD PLAIN, PITY ME, EAST DURHAM, COLLIERY, MURTON, HOUGHTON-LE-SPRING, MONKSEATON, CULLERCOATS, KILLINGWORTH, PALMERSVILLE, BENTON, LONGBENTON, WANSBECK ROAD, FAWDON, KENTON, SOUTH GOSFORTH, ILFORD ROAD, WEST JESMOND, JESMOND, WESTERHOPE, DENTON BURN, BENWELL, MANORS, BYKER, CHILLINGHAM ROAD, WALLSEND, HADRIAN ROAD, HOWDON, PERCY MAIN, WALKER, BLADON, BENSHAM, FELLING, PELAW, BROCKLEY WHINS, HEBBURN, JARROW, BEDE, SIMONSIDE, DOWNHILL, UNIVERSITY, MILLFIELD, PALLION, SPRINGWELL, SOUTH HYLTON, LEAM LANE, LOW FELL, KIBBLESWORTH, OUSTON, BIRTLEY, RICKLETON, FATFIELD, SHINEY ROW;
- **Metro station + Bicycle & Scooter Smart-parking (1 point):** MONUMENT.

Non-integrated units for Private Transport with Metro:

- **Metro station (1 point):** BEST VIEW on the New Bridge.

Integrated points of Metro with Private Transport shown in the Figure 80.

One of the areas of redistribution of passengers from Private vehicles to Public transport is to expand the network of **Car sharing Clubs**. They have various advantages and strengths, opportunities, weaknesses and threats.

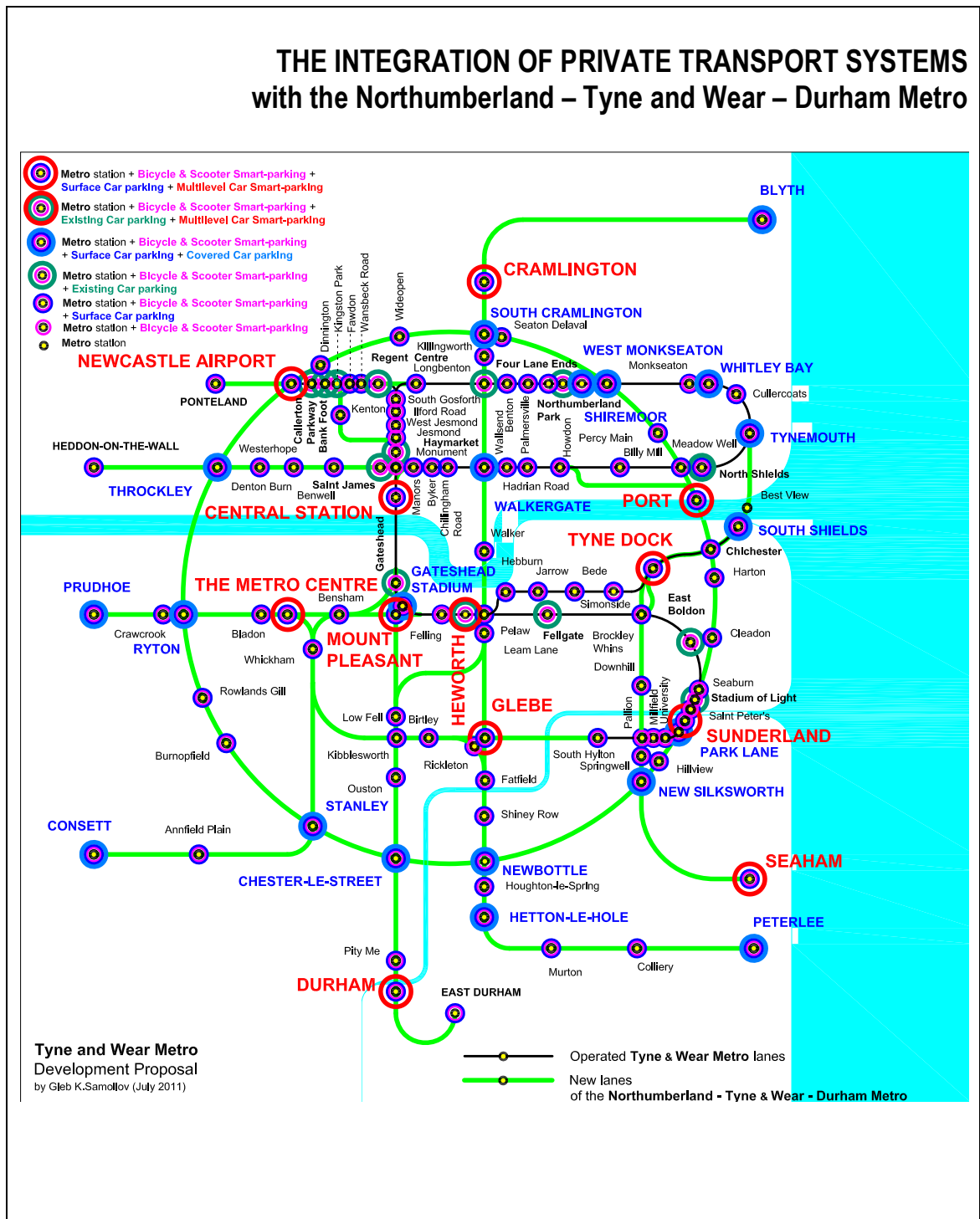


Figure 80.
THE INTEGRATION OF PRIVATE TRANSPORT SYSTEMS
with the Northumberland – Tyne and Wear – Durham Metro.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

STRENGTHS:

Free choice of the type of vehicle for different kinds of trips:

- An ordinary car (commuting);
- Large car or van (family trip to visit, leisure and entertainment, shopping);
- Sports car (trips to the various club events or competitions);
- Class car (travel to business meetings, talks and receptions, club events);
- SUV (trips for hunting, fishing, motor cross);
- A small two-seater (a trip to the race track with the younger children to learn to drive a car).

Free choice of car brand:

- The car of the nomenclature of several major European, American and Asian corporations;
- The car from the collection of small companies;
- Car tuning by range of companies;
- Retro collection.

Free choice of color and character hood trim.

Free choice and time of travel (car of that class will be delivered to the specified location at a given time).

Free choice and the end of the trip (by car can be left at any time, anywhere).

Set of benefits may be limited financial capacity of the club members. According to them, may be determined by membership category with a corresponding set of services:

- The Complete;
- The Short set;
- The Minimal set.

OPPORTUNITIES:

The possibility of a free replacement for the type of vehicle at any time:

- Before the trip;
- During the trip.

The possibility of a free replacement car brand at any time:

- Before the trip;
- During the trip.

The possibility of a free replacement car for the same with a different colored hood and trim another character at any time:

- Before the trip;
- During the trip.

The possibility of a free replacement time and place of the trip.

The possibility of a free replacement seats and the end of the trip.

The possibility of a free replacement car at any time and any place in the event of:

- Road accident;
- Car breakdown.

The possibility to change the membership category (for narrowing or widening the range of services), depending on the financial ability for a given period of time.

WEAKNESSES:

The need to form a large fleet of cars by type (Regular cars; Large cars; Minibuses; Sports cars; Cars of the class; SUVs; Small double cars) and by brand (Cars from the nomenclature of several major European, American and Asian corporations; Cars from the collection of Small companies; Cars from the range of Tuning companies; Retro collectibles).

Necessity to keep the large staff of service personnel (duty drivers, mechanics, dispatch) with non-stop duty.

The need for rental property or the garage and open parking lots across the Country.

The need for constant updating and the formation of an extensive database for sale, rent, lease, exchange motor vehicles in accordance with the wishes of current and future members.

The need for constant monitoring of current and future requests of Club members.

The need for a contract for permanent maintenance and repair of various Types and Brands.

The need for constant replenishment of the financial fund for the purchase and leasing.

The large value of contributions for the vast range of services offered by the Club.

THREATS:

Failure to comply with contractual obligations by contractors:

- to provide car declared type and grade;
- to provide the vehicle to a particular time and place;
- Vehicle maintenance.

Absence of car ordered by the type and brand due to late return by the previous user:

- Changes in the conditions of the lease time;
- the need for unscheduled maintenance or repair.

Seasonal or occasional fluctuations in demand for cars and certain Types of Brands, which reduces the economic efficiency of the Club.

Decline in demand for existing property in the Club cars and the complexity of their implementation or replacement.

Fluctuations in the number of members, which reduces economic efficiency. This leads to a decrease in the quality of services or raising fees.

Developed network of these clubs will reduce the number of private cars to objectively necessary for travel size.

It is advisable to develop the Network of such clubs for motorcyclists and cyclists.

5.3 The Improving of the Environmental Protection System in the aspect of the Integrated scheme of Public and Private transport creation

The Policy of rationing allocation of Hydrocarbons has a significant impact on transportation solutions. Travel related to work, gradually being replaced by more sophisticated communications. Metro the most advantageous way implement basic advantages, since cars are different and massive emissions of hydrocarbons into the atmosphere.

All the more widely distributed rationing allocation of hydrocarbons. Respectively, are the most promising options for travel to low-pollution. For the user, increasing importance is the ease of transport integration. In this basic position of the underground Metro system integration creates conditions for the least pollution.

Possible changes in the tax system in different modes depending on the degree of environmental pollution. The magnitude of the charge increases from low – to Metro, the average – for buses and high – for private cars.

The overall effect is to reduce the use of a particular mode by increasing the cost of services. The priority will be to use combinations of modes of transport. The most profitable is the presence of a single ticket for all modes of transport. In the future, in the Single ticket system can be enabled using the Rental Car and Taxi. This trip is more effective and leads to a gradual reduction of Public Street transport and Private vehicles transport.

With the development of an Integrated Network of Public and Private transport it is possible to improve the system of Environmental protection. Opportunities opening up in several directions.

IN THE SECTOR OF THE BUS SERVICE.

Translated from the central parts of the streets parallel Bus routes in the underground position. Preserving the historical and objective normally functioning circuit bus to the center, this is, first, release the main streets of the intense flow of buses and, secondly, will organize a commercially attractive pedestrian and bicycle-scooter zone, and, third, will provide emission reductions exhaust gases of cars as it allows them to collect and purify locally through a system of forced ventilation of underground stations.

Development of the Metro network allows for fewer buses. The routes are short. Accordingly, the reduced amount of gas and noise pollution.

IN THE SECTOR OF THE METRO SERVICE.

Changing the fare system (the Zone system is replaced by the Single Price, return to the Coin system or the Tokens system of Metro entrance) eliminates the need for paper tickets or plastic cards.

Surface location of the Tyne & Wear Metro lines has a negative impact on the environment and complicates the normal operation of road transport:

- Electromagnetic radiation;
- Noise impact;
- Single-level crossings create traffic delays and increase the level of emissions due to the acceleration of vehicles after the intersection.

The Northumberland – Tyne & Wear – Durham Metro network only involves the construction of underground lines.

After completion of the Northumberland – Tyne & Wear – Durham line of the existing ground leaving only the following sites:

- Regent Centre – Longbenton – South Gosforth (exit metro-trains in tunnels at the Depot);
- Benton – Palmersville and part of the site of the Northumberland Park – Shiremoor (exit metro-trains to Regional rail system);
- Gateshead Stadium – Felling – Heworth – Pelaw – a bifurcation in Hebburn and Fellgate (exit metro-trains to Regional rail system and the site of joint operation of the Tyne & Wear Metro and Regional railways);
- the Existing Bridge over the River Tyne (Central Station – Gateshead segment);
- the Existing Bridge over the River Wear (segment near the station Sunderland);
- the New Bridge over the River Tyne with the Best View Station at South Shields – Tynemouth segment.

Other sites that prior to the intensive construction of the NORTHUMBERLAND – TYNE & WEAR – DURHAM METRO lines were occupied land, I consider it expedient to turn to beautiful parks charming boulevards:

- *AIRPORT – Callerton Parkway – Bank Foot – Kingston Park – Fawdon – Wansbeck Road – REGENT CENTRE*;
- *SOUTH GOSFORTH – Ilford Road – West Jesmond – JESMOND*;
- *LONGBENTON – Four Lane Ends – BENTON*;
- *PALMERSVILLE – NORTHUMBERLAND PARK*;
- *SHIREMOOR – West Monkseaton – Monkseaton – Whitley Bay – Cullercoats – TYNEMOUTH*;
- *MANORS – Byker – Chillingham Road – Walkergate – Wallsend – Hadrian Road –

Howdon – Percy Main – Meadow Well – North Shields – TYNEMOUTH*;

- *HEBBURN – Jarrow – Bede – Simonside – Tyne Dock – Chichester – SOUTH SHIELDS*;

- *FELLGATE – Brockley Whins – East Boldon – Seaburn – Stadium of Light – SAINT PETER'S*;

- *MILLFIELD – Pallion – SOUTH HYLTON*.

Here, between the entrances to underground Metro stations will be built convenient pedestrian paths and bicycle paths, planted trees and shrubs, lawns and arranged flower beds, put benches and light pavilions, playgrounds for children and places of quiet rest. 3.5 square kilometers the most valuable territory in the form of beautifully landscaped green spaces will be return to the Tyne and Wear Conurbation. These plots of land alienation Tyne & Wear Metro lines previously used inefficiently and are environmentally harmful. The Scheme of the Boulevard on the Old Tyne and Wear Metro lines shown in the Figure 81.

An example of successful regeneration unexploited urban railways are recently discovered HIGH LINE PARK in New York City: [465; 466]. This beautiful Park is very popular among residents and visitors one of the largest United States cities. The Beautiful Boulevard on the Old Tyne & Wear Metro lines will decorate the Conurbation.

Developed network of Metro can significantly reduce the number of trips by car or bus. Part of freight transport (small loads and mailbox) can also be carried out on the Metro. As a result, perhaps a significant reduction in land passenger and freight traffic flow and reducing the number of cars of different classes. This dramatically reduces the negative impact on the environment.

IN THE SECTOR OF THE PARKING SERVICE AND THE PRIVATE TRANSPORT.

Underground or surface automated parking (the Smart parking) is the parking system of vertical circulation-type parking lot of cars, motorcycles, scooters, cycles in a confined space. This system eliminates the car engine on arrival at the parking lot and exit from the parking space. These parking lots are distinguished: space efficiency, low noise level and low-cost electricity.

The Tyne and Wear Conurbation Integrated Public Transport System based on the Metro developed network – is one possible application of “Best Available Technology” in accordance with the ISO 14000 standards [467; 488].

Conclusions of the Fifth chapter

Held in the Fifth chapter analysis led to following conclusions:

1. Developed network of the Metro makes it suitable as a basis for integration of public and private transport Conurbation.
2. The System of Integration allows for easy passenger spatial interaction of different types of public and private transport:
 - air terminal, marine station, railway station, bus station, bus stop, metro station;
 - air terminal, marine station, railway station, taxi hub, taxi stop, metro station;
 - air terminal, marine station, railway station, multilevel car smart parking (underground and surface), covered car parking, existing car parking, surface car parking, bicycle & scooter smart parking (underground and surface), metro station.
3. Point of the Integration of different public and private transport with the Metro on the composition of different elements.

4. The formation of the Integrated System of Public and Private transport allows us to solve many important problems in Environmental protection.

CONCLUSION

The current system of Tyne and Wear Metro lanes formed on the basis of delivery of coal from mines to port facilities. Subsequently, in order to save money, these same freight lanes have been transformed into the passenger lane. Further development, to save money, followed the path of conversion of these lanes in the Light Metro. Currently, potential freight transport system, in a converted passenger, completely exhausted.

Need to move on to the Modern Passenger Transport System, off-street transportation, which allows you to cater for the increasing flow of passengers. The formation of a developed network of Metro not only provides ease of travel, but also significantly increases the mobility of the population.

Tyne & Wear Metro operating lines occupy about 4.0 square kilometers of territory. Part of this territory is located among residential areas. Further development of the Tyne & Wear Metro location at ground lines still require 10.0 – 12.0 square kilometers of territory.

Laying the lines on existing streets is impossible. Demolition of houses and public buildings, the destruction of historical monuments and parks, changing the natural landscape for the construction of new lines in principle unacceptable.

Finance the First phase can be carried out on the basis of a loan guaranteed by the Government. After the First phase will gradually increase the investment attractiveness of the Tyne & Wear Conurbation. You will be able to organize Joint-Stock Company, for example.

The NORTHUMBERLAND – TYNE and WEAR – DURHAM METRO Network can form the Developed Integrated System of Public and Private Transport for the Tyne and Wear Conurbation.

The Integrated system of Public and Private Transport includes the following types of contacts:

AIR TERMINAL + MARINE STATION + RAILWAY STATION + BUS STATION + BUS STOP + TAXI HUB + TAXI STOP + MULTILEVEL CAR SMART PARKING + COVERED CAR PARKING + EXISTING CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + METRO STATION.

Different combinations of contacts form five types of integration points.

Main points of Integration with the Metro (11 points for 7 contacts).

At Existing stations (4 points)

- AIR TERMINAL + BUS STATION + TAXI HUB + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Newcastle Airport;
- RAILWAY STATION + BUS STOP + TAXI HUB + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (2 points): Newcastle Central Station, Sunderland;
- RAILWAY STATION + BUS STOP + TAXI STOP + MULTILEVEL CAR SMART PARKING + EXISTING CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point).

At New stations (7 points)

- MARINE STATION + BUS STATION + TAXI HUB + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Port;
- RAILWAY STATION + BUS STATION + TAXI HUB + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (2 points): Durham, Seaham;

The INTEGRATION of Avia-, Marine-, Railway-, Bus-, Taxi-services and Private Transport with the Northumberland – Tyne and Wear – Durham Metro

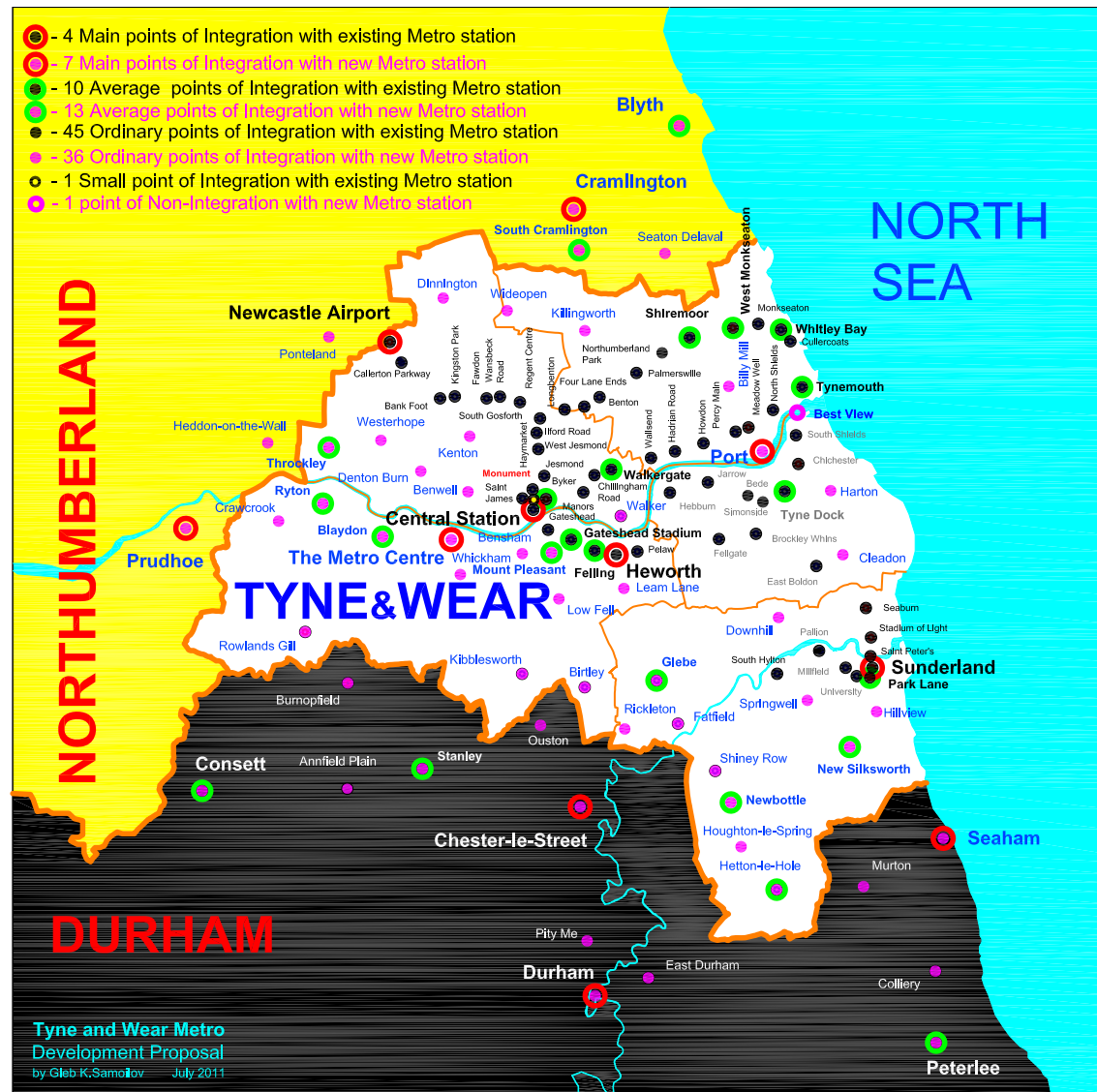


Figure 82.
The INTEGRATION of Avia-, Marine-, Railway-, Bus-, Taxi-services and Private Transport with
the Northumberland – Tyne and Wear – Durham Metro.

Images source:
Drawing of the Author of the Tyne & Wear Metro Development proposals – Gleb K.Samoilov (July, 2011).

- RAILWAY STATION + BUS STATION + TAXI HUB + COVERED CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Prudhoe;
- RAILWAY STATION + BUS STOP + TAXI HUB + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (2 points): Cramlington, The Metro Centre;
- RAILWAY STATION + BUS STOP + TAXI STOP + COVERED CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Chester-le-Street.

Average points of Integration with the Metro (23 points for 6 contacts).

At Existing stations (11 points)

- BUS STOP + TAXI HUB + COVERED CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (2 point): Gateshead Stadium; South Shields;
- BUS STOP + TAXI STOP + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Felling;
- RAILWAY STATION + BUS STOP + TAXI STOP + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Manors;
- BUS STOP + TAXI STOP + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Tyne Dock;
- BUS STOP + TAXI STOP + COVERED CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (6 points): Park Lane, Tynemouth, West Monkseaton, Wallsend, Whitley Bay, Shiremoor.

At New stations (12 points)

- RAILWAY STATION + BUS STOP + TAXI STOP + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Blaydon;
- BUS STOP + TAXI STOP + MULTILEVEL CAR SMART PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Mount Pleasant;
- BUS STOP + TAXI STOP + COVERED CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (7 points): New Silksworth, Newbottle, Stanley, Ryton, Throckley, Hetton-le-Hole, South Cramlington;
- BUS STATION + TAXI STOP + COVERED CAR PARKING + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (3 points): Peterlee, Consett, Blyth.

Ordinary points of Integration with the Metro (81 points for 5 contacts).

At Existing stations (45 points)

- BUS STATION + TAXI HUB + EXISTING CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Haymarket;
- BUS STOP + TAXI HUB + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Pelaw;
- BUS STOP + TAXI HUB + EXISTING CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (4 points): Stadium of Light, Regent Centre, Saint James, Northumberland Park;
- BUS STOP + TAXI STOP + EXISTING CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (8 points): Four Lane Ends, Kingston Park, Bank Foot, Callerton Parkway, North Shields, East Boldon, Fellgate, Gateshead;

- BUS STOP + TAXI STOP + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (31 points): Meadow Well, Chichester, Seaburn, Saint Peter's, Walker, Walkergate, Jesmond, West Jesmond, Ilford Road, South Gosforth, Wansbeck Road, Fawdon, Byker, Chillingham Road, Hadrian Road, Howdon, Percy Main, Cullercoats, Monkseaton, Palmersville, Benton, Longbenton, South Hylton, Pallion, Millfield, University, Brockley Whins, Hebburn, Jarrow, Bede, Simonside.

At New stations (36 points)

- BUS STOP + TAXI HUB + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (2 points): Houghton-le-Spring, Low Fell;
- BUS STATION + TAXI HUB + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Heddon-on-the-Wall;
- BUS STOP + TAXI STOP + SURFACE CAR PARKING + BICYCLE & SCOOTER SMART PARKING + Metro station (33 points): Hillview, Burnopfield, Rowlands Gill, Dinnington, Wideopen, Seaton Delaval, Billy Mill, Harton, Cleadon, Colliery, Murton, Shiney Row, Fatfield, Leam Lane, Killingworth, East Durham, Pity Me, Ouston, Kibblesworth, Ponteland, Kenton, Westerhope, Denton Burn, Benwell, Bensham, Whickham, Annfield Plain, Crawcrook, Birtley, Rickleton, Downhill, Springwell.

Small points of Integration with the Metro (1 point for 4 contacts).

At Existing stations (1 point)

- BUS STOP + TAXI STOP + BICYCLE & SCOOTER SMART PARKING + Metro station (1 point): Monument.

At New stations (-).

Points of Non-Integration with the Metro (1 point for only Metro):

At Existing stations (-).

At New stations (1 point).

- Metro station (1 point): Best View.

The Integration scheme of Avia-, Marine-, Railway-, Bus-, Taxi-services and Private Transport with the Northumberland – Tyne and Wear – Durham Metro shown in the Figure 82.

The dominant position of off-street traffic will increase in speed communication between the individual items. Integrated transport system to give priority to the use of public transport.

Taken together, this will lead to an overall reduction in the number of ground transportation. This significantly reduces the amount of harmful emissions and improve the microclimate.

System of integrated public and private transport, which is generated on the basis of the developed Metro network, will improve the accessibility of individual land sites Conurbation, and the whole Conurbation as a whole. This is a substantial impact on the ease of accommodation and transport.

As the result, SIGNIFICANTLY INCREASE THE VALUE OF LAND AND INVESTMENT ATTRACTIVENESS OF THE TYNE AND WEAR CONURBATION.

Subject of this Research work has prospects of further deepening and widening.

So there are interesting prospects in detail aspects of Conventional bus routes and Express bus routes, which are integrated with the extensive network of Metro.

Considerable attention is paid to the definition of possible combinations of optimal Metro routes for different periods of days, days of weeks and seasons.

Significance for the entire North-Eastern region will have opportunities to study and project proposals for the integration of advanced Tyne and Wear Metro network with Tees Valley Metro system.

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